UNDERGRADUATE PROGRAMME
IN
MATHEMATICS

Courses of Study

Schemes of Examinations
&
Syllabi

Applicable to candidates admitted from the
Academic Year 2023-2024 onwards

PG & RESEARCH DEPARTMENT OF MATHEMATICS
THANTHAI PERIYAR GOVERNMENT
ARTS & SCIENCE COLLEGE (Autonomous)
(Nationally Reaccredited at 'A' Level by NAAC)
TIRUCHIRAPPALLI – 620 023.

UNDER GRADUATE PROGRAMME

Programme Outcomes:

PO1: Ability to acquire in-depth knowledge of several branches of mathematics which in turn leads to study of related areas like computer science and physical science. Thus, this Program helps learners in building a solid foundation for higher studies in mathematics.

PO2: Able to present mathematics clearly and precisely, make vague ideas precise by formulating them in the language of mathematics, describe mathematical ideas from multiple perspectives and explain fundamental concepts of mathematics to non-mathematicians

PO3: Able to present mathematics clearly and precisely, make vague ideas precise by formulating them in the language of mathematics, describe mathematical ideas from multiple perspectives and explain fundamental concepts of mathematics to non-mathematicians

PO4: Utilize mathematics to solve theoretical and applied problems by critical understanding, analysis and synthesis. Ability to analyse, interpret and draw conclusions from quantitative and qualitative data; and critically evaluate ideas, evidence, and experiences from an open minded and reasoned perspective.

PO5: Ability to share ideas and insights while seeking and benefitting from knowledge and to communicate mathematics effectively by written, computational and graphic means. This helps them to learn behave responsibly in a rapidly changing interdependent society.

B.Sc. MATHEMATICS

Programme Specific Outcomes:

PSO1: A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions like notations, terminology.

PSO2: A student should get adequate exposure to global and local concerns that explore them many aspects of mathematical sciences.

PSO3: Student is equipped with mathematical modelling ability, problem solving skills, creative talent and power of communication necessary for various kinds of employment.

PSO4: Student should be able to apply their skills and knowledge and education to translate information presented verbally into mathematical form,

select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.

PSO5: Enabling students to develop an attractive attitude towards mathematics as an interesting and valuable subject of study

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) can be carried out accordingly, assigning the appropriate level in the grids:

	Pos					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1										
CO2										
CO3										
CO4										
CO5										

THANTHAI PERIYAR GOVERNMENT ARTS AND SCIENCE COLLEGE(AUTONOMOUS), TIRUCHIRAPPALLI-23										
GENERAL COURSE PATTERN FOR UG MATHEMATICS - 2023-2024 ONWARDS										
SL. NO.	**PART**	**COURSE**		**Sub-Code**	**COURSE TITLE**	**Hrs.**	**Credits**	**CIA**	**Semester Exam**	**Total**
I SEMESTER										
1	P - I	TAMIL	I		LT-I : TAMIL	6	3	25	75	100
2	P - II	ENGLISH	I		LE-I : ENGLISH	6	3	25	75	100
3	P - III	CORE	I		C-I : DIFFERENTIAL CALCULUS	6	5	25	75	100
		CORE	II*		C-II : ALGEBRA AND TRIGONOMETRY	2	-	-	-	-
4		First Alli.	I	GE-I	Generic Elective - I STATISTICS-I (or) DATA STRUCTURES	4	4	25	75	100
		First Alli.	**II*-P**		Generic Elective - II STATISTICS-I PRACTICALS (or) DATA STRUCTURES PRACTICALS	2	-	-	-	-
5	P – IV	SBE	I		Skill Based Elective I: THEORY OF NUMBERS	2	2	25	75	100
6		VE			VE : VALUE EDUCATION	2	2	25	75	100
					TOTAL	**30**	**19**	**150**	**450**	**600**
II SEMESTER										
7	P - I	TAMIL	II		LT-II : TAMIL	6	3	25	75	100
8	P - II	ENGLISH	II		LE-II : ENGLISH	4	3	25	75	100
9	P - III	CORE	II		C-II : ALGEBRA AND TRIGONOMETRY	4	4	40	60	100
10		CORE	III		C-III : ANALYTICAL GEOMETRY OF THREE DIMENSIONS AND INTEGRAL CALCULUS	5	5	25	75	100
11		First Alli.	**II-P**	GE-II	Generic Elective-II STATISTICS-I PRACTICALS (or) DATA STRUCTURES PRACTICALS	3	3	40	60	100
12		First Alli.	III	GE-III	Generic Elective - III STATISTICS-II (or) BIO STATISTICS	4	4	25	75	100
13	P – IV	ES			ES : ENVIRONMENTAL SCIENCE	2	2	25	75	100
14		NMSDC*	I	AECC-I	NMSDC-I :	2	2	25	75	100
					TOTAL	**30**	**26**	**230**	**570**	**800**
III SEMESTER										
15	P - I	TAMIL	III		LT-III : TAMIL	6	3	25	75	100
16	P - II	ENGLISH	III		LE-III :ENGLISH	6	3	25	75	100
17	P - III	CORE	IV		C-IV : **:** DIFFERENTIAL EQUATIONS	4	4	25	75	100
		CORE	V*		C-V : VECTOR CALCULUS AND ITS APPLICATIONS	2	-	-	-	-
18		ME	I	C-VI	C-VI : SPECIAL FUNCTIONS AND SERIES (or) GRAPH THEORY	4	4	25	75	100
19		Sec. Alli.	I	GE - IV	Generic Elective - IV ALLIED PHYSICS-I (or) JAVA PROGRAMMING	4	4	25	75	100
		Sec. Alli.	**II*-P**	DSE-I	Discipline Specific Elective - I ALLIED PHYSICS-I PRACTICALS (or) PROGRAMMING IN JAVA LAB	2	-	-	-	-
20	P - IV	NME	I		Non Major Elective - I :	2	2	25	75	100
					TOTAL	**30**	**20**	**150**	**450**	**600**

IV SEMESTER										
21	P - I	TAMIL	IV		LT-IV : TAMIL	6	3	25	75	100
22	P - II	ENGLISH	IV		LE-IV : ENGLISH	6	3	25	75	100
23	P - III	CORE	V		C-V : VECTOR CALCULUS AND ITS APPLICATIONS	4	4	40	60	100
24		CORE	VII		C-VII : ELEMENTS OF MATHEMATICAL ANALYSIS	5	5	25	75	100
25		Sec. Alli.	**II-P**	DSE-I	Discipline Specific Elective – I ALLIED PHYSICS-I PRACTICALS (or) PROGRAMMING IN JAVA LAB	3	3	40	60	100
26		Sec. Alli.	III	DSE-II	Discipline Specific Elective - II ALLIED PHYSICS-II (or) C PROGRAMMING	4	3	25	75	100
27	P - IV	NMSDC*	II	AECC - II	NMSDC-II :	2	2	25	75	100
					TOTAL	**30**	**23**	**205**	**495**	**700**
V SEMESTER										
28	P - III	CORE	VIII		C-VIII : ABSTRACT ALGEBRA	5	5	25	75	100
29		CORE	IX		C-IX : REAL ANALYSIS	5	5	25	75	100
30		CORE	X		C-X : MATHEMATICAL MODELLING	6	5	25	75	100
31		CORE	XI		C-XI : OPERATIONS RESEARCH	5	5	40	60	100
32		ME	II	DSE-III	Discipline Specific Elective - III NUMERICAL METHODS WITH APPLICATIONS (or) FUZZY SETS AND ITS APPLICATIONS	5	3	25	75	100
33	P - IV	NME	II	NME	Non Major Elective - II	2	2	25	75	100
34		SSD		AECC - III	SSD : SOFT SKILLS DEVELOPMENT	2	2	25	75	100
35	P - V	EA			EA : ----	-	1	25	75	100
					TOTAL	**30**	**28**	**215**	**585**	**800**
VI SEMESTER										
36	P - III	CORE	XII		C-XII : LINEAR ALGEBRA	6	6	25	75	100
37		CORE	XIII		C-XIIII : COMPLEX ANALYSIS	6	5	25	75	100
38		CORE	XIIV		C-XIV : MECHANICS	5	5	25	75	100
39		CORE	XV		C-XV : TRANSFORMS TECHNIQUE	6	5	40	60	100
40		ME	III	DSE-IV	Discipline Specific Elective–IV ASTRONOMY (or) DISCRETE MATHEMATICS	5	3	25	75	100
41		NMSDC*	III	AECC - IV	NMSDC-III :	2	2	25	75	100
					TOTAL	**30**	**26**	**165**	**435**	**600**
					GRAND TOTAL	**180**	**142**	**1115**	**2985**	**4200**
		*Optional			Extra/Additional :					

(For the candidates admitted from the academic year 2023-2024 onwards)

CORE I: DIFFERENTIAL CALCULUS

Semester: I **Course Code :**
Hours : 6 (5L + 1T) **Credits : 5**

Prerequisite: 12th Standard Mathematics

Course Objectives: To acquire

1. The basic skills of differentiation, successive differentiation, and their applications.
2. The skill to apply Leibnitz theorem to various problems.
3. The basic knowledge on the notions of curvature and radius of curvature.
4. The basic knowledge on the notions of evolutes, involutes and envelopes.
5. The skill to use partial derivatives in solving related problems.

Course Outcomes: The students will be able to

CO1: Find the nth derivative, form equations involving derivatives and apply Leibnitz formula.

CO2: Find the partial derivative and total derivative coefficient.

CO3: Determine maxima and minima of functions of two variables and to use the Lagrange's method of undetermined multipliers.

CO4: Find the envelope of a given family of curves.

CO5: Find the evolutes and involutes and to find the radius of curvature using polar co-ordinates.

UNIT I

Successive Differentiation: Introduction (Review of basic concepts) – The n^{th} derivative - Standard results - Fractional expressions – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the n^{th} derivative of a product.

UNIT II

Partial Differentiation: Partial derivatives – Successive partial derivatives – Function of a function rule – Total differential coefficient – A special case – Implicit Functions.

UNIT III

Partial Differentiation (Continued): Homogeneous functions – Partial derivatives of a function of two variables – Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers.

UNIT IV

Envelope: Method of finding the envelope – Another definition of envelope – Envelope of family of curves which are quadratic in the parameter.

UNIT V

Curvature: Definition of Curvature – Circle, Radius and Centre of Curvature – Evolutes and Involutes – Radius of Curvature in Polar Co-ordinates.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. S. Narayanan, T.K.Manicavachagam Pillai, "Differential Calculus, Volume- I", S.V.Publications, 2016.

   Unit I : Chapter 3 : § 1, 2

   Unit II: Chapter 8: § 1.1 – 1.5

   Unit III: Chapter 8: § 1.6,1.7, 4, 5

   Unit IV: Chapter 10: § 1.1 – 1.4

   Unit V: Chapter 10: § 2.1 – 2.6.

Reference Book(s):

1. R. Courant and F. John, Introduction to Calculus and Analysis (Volumes I & II), Springer- Verlag, New York, Inc., 1989.
2. S. Goldberg, Calculus and Mathematical analysis.
3. T. Apostol, Calculus, Volumes I and II.

Website and e-Learning Source(s):

1. https://nptel.ac.in.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	1	2	3	4	5	3	2	1	1	1
CO2	3	1	3	-	-	3	2	1	1	1
CO3	2	1	3	-	-	3	2	1	1	1
CO4	3	2	3	2	-	3	2	1	1	1
CO5	3	2	3	2	1	3	2	1	1	1

(For the candidates admitted from the academic year 2023-2024 onwards)

CORE II: ALGEBRA AND TRIGONOMETRY

Semester: I **Course Code:**

Hours : 6 (5L + 1T) **Credits : 4**

Prerequisite: 12th Standard Mathematics

Course Objectives: To acquire the basic ideas on

1. The Theory of Equations, Matrices.
2. The Number Theory.
3. The expansions of trigonometry functions.
4. The expansions of hyperbolic functions.
5. The solutions of theoretical and applied problems.

Course Outcomes: The students will be able to

CO1: Classify and Solve reciprocal equations

CO2: Find the sum of binomial, exponential and logarithmic series

CO3: Find Eigen values, eigen vectors, verify Cayley – Hamilton theorem and diagonalize a given matrix.

CO4: Expand the powers and multiples of trigonometric functions in terms of sine and cosine.

CO5: Determine relationship between circular and hyperbolic functions and the summation of trigonometric series.

UNIT I

Reciprocal Equations-Standard form–Increasing or decreasing the roots of a given equation- Removal of terms, Approximate solutions of roots of polynomials by Horner's method – related problems.

UNIT II

Summation of Series: Binomial– Exponential –Logarithmic series (Theorems without proof) – Approximations - related problems.

UNIT III

Characteristic equation – Eigen values and Eigen Vectors- Similar matrices - Cayley – Hamilton Theorem (Statement only) - Finding powers of square matrix, Inverse of a square matrix up to order 3, Diagonalization of square matrices – related problems.

UNIT IV

Expansions of $\sin n\theta$, $\cos n\theta$ in powers of $\sin\theta$, $\cos\theta$ – Expansion of $\tan n\theta$ in terms of $\tan\theta$, Expansions of $\cos n\theta$, $\sin n\theta$, $\cos m\theta \sin n\theta$ – Expansions of $\tan(\theta_1+\theta_2+,\ldots,+\theta_n)$ - Expansions of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in terms of θ - related problems.

UNIT V

Hyperbolic functions – Relation between circular and hyperbolic functions, Inverse hyperbolic functions, Logarithm of complex quantities, Summation of trigonometric series - related problems.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. T.K.Manicavachagam Pillai, T.Natarajan and K.S.Ganapathy, "Algebra,Volume- I", S.V.PVT. Ltd, 2010

   Unit I: Chapter 6: § 16, 17, 19, 30

   Unit II: Chapter 3: § 10, Chapter 4: § 3, 9, 11
2. T.K.Manicavachagam Pillai, T.Natarajan and K.S.Ganapathy, "Algebra, Volume- II", S.V. PVT. Limited, 2010

   Unit III: Chapter 2: § 16
3. S.Narayanan,T.K.Manicavachagam Pillai, "Trigonometry", S.V. PVT. Ltd., 2010

   Unit IV: Chapter 3

   Unit V: Chapter 4, Chapter 5: § 5, Chapter 6: § 1, 2.

Reference Book(s):

1. J. Stewart, L. Redlin, and S. Watson, Algebra and Trigonometry, Cengage Learning, 2012.
2. W.S. Burnstine and A.W. Panton, Theory of equations
3. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007.
4. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005.
5. C. V. Durell and A. Robson, Advanced Trigonometry, Courier Corporation, 2003.
6. Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010.

Website and e-Learning Source(s):

1. https://nptel.ac.in.

For Mapping with POs and PSOs:

	POs					PSOs				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	1	3	-	-	3	2	1	1	1
CO2	2	1	3	1	-	3	2	1	1	1
CO3	3	1	3	1	-	3	2	1	1	1
CO4	3	1	3	-	-	3	2	1	1	1
CO5	3	1	3	-	-	3	2	1	1	1

(For the candidates admitted from the academic year 2023-2024 onwards)

Skill Based Elective I: THEORY OF NUMBERS

Semester : I **Course Code:**

Hours : 2 **Credits : 2**

Prerequisite: 12th Standard Mathematics

Course Objectives:

1. To introduce different techniques in the theory of numbers
2. To develop skills in solving problems using these techniques.
3. To know different methods for finding the divisors of numbers.
4. To understand the properties of congruence.
5. To know various theorems in the theory of numbers.

Course Outcomes: The students will be able to

CO1: Find the divisibility of numbers using different techniques.

CO2: Find the highest power of a prime p contained in n!.

CO3: Solve numerical problems using the properties of congruences.

CO4: Find the arithmetical progression of numbers.

CO5: To solve problems using Fermat's theorem, Wilson's Theorem and Lagrange's theorem.

UNIT I

Prime and composite numbers – Prime number theorem (no proof) – Division of a given number N and related problems.

UNIT II

Euler's function – The integral part of a real number – The highest power of a prime p contained in n! and related problems.

UNIT III

The product of r consecutive integers – Congruences - Divisibility of a number from the properties of congruences and related problems.

UNIT IV

Numbers in arithmetical progression – Congruences of polynomials and related problems**.**

UNIT V

Fermat's theorem, Wilson's Theorem, Lagrange's theorem and related problems.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. T.K.Manicavachagam Pillai, T. Natarajan and K.S.Ganapathy, "Algebra, Volume- II", S.V. PVT. Limited, 2010.

   Unit I: Chapter 5 - § 1 - 7

   Unit II: Chapter 5 - § 8 - 10

   Unit III: Chapter 5 - § 11 - 13

   Unit IV: Chapter 5 - § 14 - 15

   Unit V: Chapter 5 - § 16 – 18

Reference Book(s):

1. L.E. Dickson, History of the Theory of Numbers, Dover Books on Mathematics, 2005.

Website and e-Learning Source(s):

1. https://nptel.ac.in.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	1	3	-	-	3	2	1	1	1
CO2	2	1	3	1	-	3	2	1	1	1
CO3	3	1	3	1	-	3	2	1	1	1
CO4	3	1	3	-	-	3	2	1	1	1
CO5	3	1	3	-	-	3	2	1	1	1

(For the candidates admitted from the academic year 2023-24 onwards)

CORE III: ANALYTICAL GEOMETRY OF THREE DIMENSIONS AND INTEGRAL CALCULUS

Semester: II **Course Code :**

Hours : 5 (4 L + 1 T) **Credits : 5**

Prerequisite: 12th Standard Mathematics

Course Objectives:

1. Necessary skills to analyse characteristics and properties of two- and three-dimensional geometric shapes.
2. To present mathematical arguments about geometric relationships.
3. To solve real world problems on geometry and its applications.
4. To study straight lines, planes and spheres.
5. To gain knowledge on reduction formulae, multiple integrals and improper integrals.

Course outcomes: The students will be able to

CO1: Solve the problems related to geometrical shapes studied.

CO2: Determine the reduction formulae for algebraic, trigonometric and logarithmic functions.

CO3: Evaluate double integrals and triple integrals.

CO4: Solve problems on reduction formulae.

CO5: Solve problems on improper integrals.

UNIT I

The Straight Line: Symmetrical form of a straight line - Equation of a straight line passing through two given points - The condition for the lines to be parallel to the plane - Angle between the plane and the line - Coplanar lines - shortest distance between two given lines.

UNIT II

The Sphere: Equation of a sphere - the length of the tangent - plane section of a sphere - intersection of two spheres - equation of the tangent plane. **Cone, Cylinder and Central quadrics:** The equation of the surface - Cone - Right circular cone - tangent plane and normal - condition for the plane $lx+my+nz=0$ to touch the quadratic cone $ax^2+by^2+cz^2+2fyz+2gzx+2hxy=0$ - The angle between the lines in which the plane $ux+vy+wz=0$ cuts the cone - Condition for the cone to have three mutually perpendicular generators.

UNIT III

Integration: Reduction formulae - Integral of $e^{ax}\cos bx\,dx$ - Bernoulli's formula - Geometrical applications of integration - **Physical applications of integration:** centroid - centre of mass - Moment of inertia - Work done by a force - Compound interest law.

UNIT IV

Multiple Integrals: Double integrals - Triple integrals - Applications of multiple integrals. Change of variables: Jacobian.

UNIT V

Improper Integrals: Beta and Gamma functions: Infinite integrals - Beta Gamma functions - recurrence formula of Gamma functions - Properties of Gamma functions - Relation between Beta and Gamma functions - evaluation of definite integrals using Gamma functions - Applications of Gamma functions to multiple integrals.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. T.K. Manicavachagom Pillay & T. Natarajan, "A Text Book of Analytical Geometry Part II - Three Dimensions", S. Viswanathan (Printers & Publishers) Pvt Ltd., Reprint 2013.
   Unit I: Chapter III - § 1 to 8
   Unit II: Chapter IV - § 1 to 8, Chapter V - § 1 to 7.
2. S. Narayanan & T. K. Manicavachagom Pillay, "Calculus - Volume II", S. Viswanathan (Printers & Publishers) Pvt Ltd., Reprint 2013.
   Unit III: Chapter 1 - § 13 & 14, Chapter 2 - § 1 to 5
   Chapter 3 - § 1.1 to 1.5, 2.1 to 2.5, 4 & 5
   Unit IV: Chapter 5 - § 1 to 7, Chapter 6 - § 1 & 2
   Unit V: Chapter 7 - § 1 to 6.

Reference Book(s):

1. S. L. Loney, Co-ordinate Geometry.
2. Robert J. T. Bell, Co-ordinate Geometry of three dimensions.
3. William F. Osgood and William C. Graustein, Plane and Solid Analytic Geometry, Macmillan Company, New York, 2016.
4. G. B. Thomas and R. L. Finny, Calculus and Analytical Geometry, Pearson Publications, 9th Edition, 2010.
5. H.Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.
6. G.B. Thomas and R. L. Finny, Calculus, Pearson Education, 2007.

Website and e-Learning Source(s):

1. https://nptel.ac.in.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	1	3	-	-	3	2	1	1	1
CO2	3	1	3	-	-	3	2	1	1	1
CO3	2	1	3	-	-	3	2	1	1	1
CO4	3	2	3	2	-	3	2	1	1	1
CO5	3	2	3	2	1	3	2	1	1	1

(For the candidates admitted from the academic year 2023-2024 onwards)

CORE IV: DIFFERENTIAL EQUATIONS

Semester : III **Course Code :**

Hours : 4 (3 L + 1T) **Credits : 4**

Prerequisite: 12th Standard Mathematics

Course Objectives:

1. Knowledge about the methods of solving Ordinary Differential Equations.
2. To understand equations of first order but of higher degree and to Determine particular integrals.
3. Knowledge about the methods of deriving partial differential equations.
4. Knowledge about the methods of solving Partial differential Equations.
5. The understanding of how differential equations can be used as a powerful tool in solving problems in science.

Course Outcomes: Students will be able to

CO1: Determine solutions of homogeneous equations, non-homogeneous equations of degree one in two variables, solve Bernoulli's equations and exact differential equations.

CO2: Find the solutions of equations of first order but of higher degree and to Determine particular integrals of algebraic, exponential, trigonometric functions and their products.

CO3: Find solutions of linear equations with variable coefficients, linear equations of second order and to find solutions using the method of variations of parameters.

CO4: Form a PDE by eliminating arbitrary constants and arbitrary functions, find complete, singular and general integrals of PDE, to solve partial differential equations by Lagrange's method.

CO5: Explain standard forms and Solve Differential equations using Charpit's method.

UNIT I

Ordinary Differential Equations: Variable separable - Homogeneous Equation - Non-Homogeneous Equations of first degree in two variables - Linear Equation - Bernoulli's Equation - Exact differential equations.

UNIT II

Equation of first order but of higher degree: Equations solvable for dy/dx - Equation solvable for y - Equation solvable for x - Clairauts' form - **Linear Equations with constant coefficients:** Definitions - The operator D - Complementary function of a linear equation with constant coefficients - Particular integral.

UNIT-III

Linear equations with variable coefficients - **Linear Equations of the Second Order:** Complete solution given a known integral - Reduction to the normal form- Change of the Independent Variable- Variation of Parameters.

UNIT-IV

Partial differential equations of the first order: Classification of integrals

- Derivation of partial differential equations - By Elimination of constants – By Elimination of an arbitrary function – Lagrange's method of solving the Linear Equation.

UNIT-V

Special methods – Standard forms - Charpit's Method.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s) :

1. S.Narayanan ,T.K.Manickavachagom Pillay, "Differential Equations and its Applications", Ninth Edition, S.Viswanathan (Printers & Publishers) PVT. LTD., 2010.

   UNIT I : Chapter II: § 1 to 6.

   UNIT II : Chapter IV: § 1, 2.1, 2.2, 3.1, Chapter V: § 1 to 4.

   UNIT III: Chapter V: § 5, Chapter VIII: § 1 to 4.

   UNIT IV: Chapter XII: § 1 to 4.

   UNIT V : Chapter XII: § 5.1 to 5.4 and 6

Reference Book(s):

1. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.
2. I. Sneddon, Elements of Partial Differential Equations, McGraw-Hill, International Edition, 1967.
3. G.F. Simmons, Differential equations with applications and historical notes, 2nd Ed, Tata Mcgraw Hill Publications, 1991
4. D.A. Murray, Introductory course in Differential Equations, Orient and Longman H.T. H. Piaggio, Elementary Treaties on Differential Equations and their applications, C.B.S Publisher & Distributors, Delhi,1985.
5. Sundarapandian, V. Ordinary and Partial Differential Equations, Tata McGraw Hill Education Pvt.Ltd. New Delhi, 2013.

Website and e-Learning Source(s):

1. http://mathworld.wolfram.com
2. https://pdflife.one/download/4539574-downloads-ordinary-and-partial-differential-equations-by-m-d-raisinghania-s-chand-pdf.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	2	2	2	3	1	2	3	2	1
CO2	2	1	3	1	3	3	2	2	3	1
CO3	3	2	3	1	3	3	2	3	2	1
CO4	1	3	2	2	3	3	2	2	3	2
CO5	3	1	2	3	3	2	2	3	3	1

(For the candidates admitted from the academic year 2023-2024 onwards)

CORE V: VECTOR CALCULUS AND ITS APPLICATIONS

Semester: III **Course Code :**

Hours : 6 (5L + 1T) **Credits : 4**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. Knowledge about differentiation of vectors and on differential operators.
2. Knowledge about derivatives of vector functions.
3. Skills in evaluating line integrals.
4. Skills in evaluating surface and volume integrals.
5. The ability to analyze the physical applications of derivatives of vectors.

Course Learning Outcomes:

Students will be able to

CO1: Find the derivative of vector and sum of vectors, product of scalar and vector point function and to determine derivatives of scalar and vector products.

CO2: Applications of the operator 'del' and to Explain solenoidal and irrotational vectors.

CO3: Solve simple line integrals.

CO4: Solve surface integrals and volume integrals.

CO5: Verify the theorems of Gauss, Stoke's and Green's.

UNIT I

Gradient, Curl and Divergence: Scalar and Vector point function – Level surfaces – Gradient of a scalar point function – Directional derivative of a scalar point function – Equations of tangent plane and normal line to a level surface – Examples.

UNIT II

Divergence and Curl of a vector point function: Divergence – Solenoidal vector – Curl of a vector point function – Irrotational vector – Examples - Vector Identities – Examples.

UNIT III

Vector integration: Line Integral – Application of line integral – Theorems on line integrals – Examples.

UNIT IV

Surface and Volume Integrals – Examples.

UNIT V

Gauss divergence Theorem, Stoke's Theorem, Green's Theorem (only statement) – Verification of the theorems.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. P.R.Vittal, V.Malini, "Vector Calculus, Fourier Series and Fourier Transforms", Margham Publications, Chennai, Reprint 2016.

   UNIT I : Chapter 1 : pages 6 – 22
   UNIT II : Chapter 1 : Pages 22 – 53 (omit physical interpretation of Divergence and curl)
   UNIT III : Chapter 2 : Pages 54 - 75
   UNIT IV : Chapter 2 : Pages 75 - 89
   UNIT V : Chapter 2 : Pages 89- 141 (omit proof of theorems and deductions).

Reference Book(s):

1. J.C. Susan, Vector Calculus, 4th Edition, Pearson Education, Boston, 2012.
2. A. Gorguis, Vector Calculus for College Students, Xilbius Corporation, 2014.
3. J.E. Marsden and A. Tromba, Vector Calculus, 5th edition, W.H. Freeman, New York, 1988.

Website and e-Learning Source(s):

1. https://nptel.ac.in.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**5**	**5**
CO1	3	2	3	1	3	3	2	1	1	3
CO2	3	2	3	1	3	3	2	1	2	3
CO3	3	3	3	3	3	3	3	1	2	3
CO4	3	3	3	3	3	3	3	1	2	3
CO5	3	3	3	3	3	3	3	1	2	3

(For the candidates admitted from the academic year 2023-2024 onwards)

CORE VI: SPECIAL FUNCTIONS AND SERIES

Semester : III **Course Code :**

Hours : 4 (3L + 1T) **Credits : 4**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To study the basic ideas of some important special functions
2. To study a variety of different methods of properties of such functions
3. To give thorough knowledge of binomial theorem and its applications.
4. To give thorough knowledge of exponential theorem and summations using this theorem.
5. To give wide knowledge of logarithmic series and its applications.

Course Outcomes: The students will be able to

CO1: Understand the special functions

CO2: Understand the properties of special functions and relation between the functions.

CO3: Know the Binomial, Exponential and logarithmic series.

CO4: Find the approximate values of some expression.

CO5: Find the summation of series.

UNIT I

Legendre Polynomials: Legendre's equation and its solution - Legendre's equation of the first kind -generating function for Legendre polynomials - solved examples - Orthogonal properties of Legendre's polynomials - Recurrence relations

UNIT II

Bessel functions: Bessel s' equations and its solution - Bessels' function of the first kind of order n - Relation between $J_n(x)$ and $J_{-n}(x)$, n being an integer- Bessels' function of the second kind of order n - Integration of Bessel equation in series for n =0 - solved examples -Recurrence relations for $J_n(x)$

UNIT III

Binomial theorem for rational index (without proof) - Application of the Binomial theorem to the summation of series - Approximate values.

UNIT IV

Exponential Series: Exponential Limit - The Exponential theorem – Summation (examples related to summation of series) - Examples to illustrate the method to derive some Identities.

UNIT V

The Logarithmic Series: Theorem - Modification of the logarithmic series - Summation using different forms of the Logarithmic Series – Euler's constant - Series which can be summed by the Logarithmic Series.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. Dr. M.D. Raisinghania, "Ordinary And Partial Differential Equations", S.Chand & Company Ltd,

   Unit I : § 9.1 to 9.4, § 9.8 & 9.9

   Unit II : § 11.1 , 11.2, 11.4 - 11.7

2. T.K.Manicavachagam Pillay, T. Natarajan and K.S.Ganapathy, "Algebra, Volume–I", S. Viswanathan Pvt. Ltd., Chennai, 2013.

   Unit III: Chapter 3 – § 5, 10 & 14

   Uint IV: Chapter 4 – § 1,2, 3, 3.1, 4

   Unit V : Chapter 4 - § 5, 6, 7, 8, 8.1, 9

Reference Book(s):

1. S.J.N.Sharma and Dr.R.K.Gupta, Differential Equations with Special Functions, KrishnaPrakashan Mandir.
2. Dr. S. Arumugam & Others, "Modern Analysis", First Edition, Yes Dee Publishing, 2019.

Website and e-Learning Source(s):

1. https://nptel.ac.in

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	2	1	3	2	3	1	2	3	3	1
CO2	1	2	3	1	3	3	2	2	3	1
CO3	1	2	2	1	3	3	2	3	2	1
CO4	2	3	2	3	3	2	2	2	3	2
CO5	3	1	2	3	3	2	2	3	3	1

(For the candidates admitted from the academic year 2023-2024 onwards)

CORE VI: GRAPH THEORY

Semester : III **Course Code :**

Hours : 4 (3L + 1T) **Credits : 4**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To understand types of graphs.
2. To understand properties of graph.
3. To understand Trees and circuits.
4. To understand cut sets and network flows
5. To understand Planar graphs and Chromatic number

Course Outcomes: The Students will be able to

CO1: get a thorough knowledge of properties and concepts in Graph theory.

CO2: realize the physical situation in which graph theory can be applied.

CO3: apply Graph theoretical concepts in engineering problems.

CO4: apply Graph theoretical concepts in computer science problems.

CO5: apply Graph theoretical concepts to solve Mathematical problems.

UNIT I

Graphs and subgraphs: Graphs - Application of graphs – Finite and Infinite graphs - Incidence and Degree - Isolated vertex, Pendant vertex and Null graph - Isomorphism - Subgraphs - Walks, Paths and Circuits – Connected graphs.

UNIT II

Euler and Hamiltonian graphs: Euler graphs - Operations on graphs - More on Euler graphs - Hamiltonian paths and circuits - The traveling salesman problem.

UNIT III

Trees: Trees - Some properties of trees - Pendant vertices in a tree - Distance and centers in a tree - Rooted and binary trees - Spanning trees - Fundamental circuits.

UNIT IV

Cut-sets and Cut-Vertices: Cut-sets - Some properties of cut-sets – All cut-sets in a graph - Fundamental circuits and cut-sets - Connectivity and separability - network flows.

UNIT V

Planar and Dual planar graphs: Planar graphs - Kuratowski's two graphs - Chromatic number - Chromatic partitioning - Chromatic polynomial.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. Narsingh Deo, "Graph Theory with applications to engineering and computer science", Prentice Hall of India Private Limited, 2012.

   Unit I : Chapter 1 - § 1.1 to 1.5, Chapter 2 – § 2.1 to 2.2, 2.4, 2.5.

   Unit II : Chapter 2 - § 2.6 to 2.10.

   Unit III : Chapter 3 - § 3.1 to 3.5, 3.7, 3.8.

   Unit IV : Chapter 4 - § 4.1 to 4.6.

   Unit V : Chapter 5 - § 5.2 to 5.3, 8.1 to 8.3.

Reference Book(s):

1. S. Arumugam and S. Ramachandran, Invitation to Graph Theory, SciTech Publications (India) Pvt. Ltd., Chennai, 2006.
2. F. Harary, "Graph theory", Narosa Publishing House, 2001.

Website and e-Learning Source(s):

1. https://nptel.ac.in.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	2	3	2	3	1	2	3	3	1
CO2	2	1	3	1	3	3	2	2	3	1
CO3	1	2	2	1	3	3	2	3	2	1
CO4	1	3	2	3	3	2	2	2	3	2
CO5	3	1	2	3	3	2	2	3	3	1

(For the candidates admitted from the academic year 2023-2024 onwards)

CORE VII: ELEMENTS OF MATHEMATICAL ANALYSIS

Semester : IV **Course Code :**
Hours : 5 (4L + 1T) **Credits : 5**
Pre-requisite : 12th Standard Mathematics

Course Objectives:

1. Identify and characterize sets and functions
2. Understand, test of sequences and series
3. Analyse the convergence of sequences, series
4. Analyse the divergence of sequences, series.
5. Understand metric spaces with suitable examples.

Course Outcomes: The students will be able to

CO1: Explain in detail about sets and functions, equivalence and countability and the LUB axiom. Explain about the metric spaces and functions continuous on a Metric space.

CO2: Explain Sequence and Subsequence of real numbers and to find the limit of sequence to test for convergent, divergent, bounded and monotone sequences.

CO3: Explain the operations on convergent and divergent sequences and to Explain the concepts of limit superior and limit inferior and the notion of Cauchy sequences.

CO4: Classify the series of real numbers and the alternating series and their convergence and divergence, the conditional convergence and absolute convergence and solve problems on convergence of the sequences.

CO5: Explain about the metric spaces and functions continuous on a Metric space.

UNIT I

Sets and Functions: Sets and Elements - Operations on sets – Functions - Real valued functions – equivalence – Countability - Real numbers - Least upper bounds.

UNIT II

Sequences of Real Numbers: Definition of a sequence and subsequence - limit of a sequence – convergent sequences – divergent sequences - bounded sequences - monotone sequences.

UNIT III

Operations on convergent sequences – operations on divergent sequences – limit superior and limit inferior - Cauchy sequences.

UNIT IV

Series of Real Numbers: Convergence and divergence – series with non – negative terms- alternating series-conditional convergence and absolute convergence - Rearrangements of series.

UNIT V

Tests for absolute convergence - Series whose terms form a non-increasing sequence - Summation by parts - **Limits and Metric Spaces:** Limit of a function on a real line - Metric spaces - Limits in metric spaces.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. Richard R. Goldberg, Methods of Real Analysis: Oxford and IBH Publishing, (1 January 2020).
   https://alansinyal.files.wordpress.com/2012/08/method-of-real-analysis.pdf
   Unit I : Chapter 1 : § 1.1 To 1.7.
   Unit II : Chapter 2 : § 2.1 To 2.6
   Unit III : Chapter 2 : § 2.7 To 2.10
   Unit IV : Chapter 3 : § 3.1 To 3.5
   Unit V : Chapter 3 : § 3.6 to 3.8 and
   Chapter 4 : § 4.1 to 4.3

Reference Book(s):

1. T. M. Apostol, Calculus (Vol. I), John Wiley and Sons (Asia) P. Ltd., 2002.
2. R.G. Bartle and D. R Sherbert, Introduction to Real Analysis, John Wiley and Sons (Asia), 2000.
3. E. Fischer, Intermediate Real Analysis, Springer Verlag, 1983.
4. K.A. Ross, Elementary Analysis- The Theory of Calculus Series- Undergraduate Texts in Mathematics, Springer Verlag, 2003.

Website and e-Learning Source(s):

1. https://nptel.ac.in

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	3	2	3	3	3	2	1	1	3
CO2	3	3	2	3	3	3	2	1	2	3
CO3	3	3	3	3	3	3	3	1	2	3
CO4	3	3	3	3	3	3	3	1	2	3
CO5	3	3	2	3	3	3	3	1	2	3

(For the candidates admitted from the academic year 2023-2024 onwards)

CORE VIII – ABSTRACT ALGEBRA

Semester : V **Course Code:**

Hours: 5 (5L + 1T) **Credits : 5**

Pre-requisite: 12th Standard Mathematics

Course Objectives: To enable the students to

1. Know the concepts of Groups and cyclic groups.
2. Explain about Normal subgroup and homomorphism.
3. Understand the concepts of permutation groups.
4. Know about rings and ideals.
5. Construct the characteristics and apply the abstract algebraic structures**.**

Course Outcomes: The students will be able to

CO1: Understand the concepts of groups, subgroups and cyclic groups.

CO2: Know about Normal subgroup, Quotient groups and verify the functions for homomorphism and automorphism properties.

CO3: Explain Permutation groups and apply Cayley's theorem to problems.

CO4: Gain knowledge of Rings, Ideals and Quotient Rings and examine their structure.

CO5: Understand the field of quotient of an integral domain and Euclidean Rings.

UNIT I

Introduction to groups – Subgroups - cyclic groups and properties of cyclic groups - Lagrange's Theorem - A counting principle – Examples.

UNIT II

Normal subgroups and Quotient group - Homomorphism- Automorphism - Examples.

UNIT III

Cayley's Theorem - Permutation groups – Examples.

UNIT IV

Definition and examples of ring - Some special classes of rings - homomorphism of rings - Ideals and quotient rings - More ideals and quotient rings.

UNIT V

The field of quotients of an integral domain - Euclidean Rings - The particular Euclidean Ring – Examples.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. I.N.Herstein, "Topics in Algebra", Wiley Eastern Ltd. Second Edition, 2006.

   Unit 1: Chapter 2 - § 2.1 to 2.5

   Unit 2: Chapter 2 - § 2.6 to 2.8

   Unit 3: Chapter 2- § 2.9, 2.10

   Unit 4: Chapter 3 -§ 3.1 to 3.5

   Unit 5: Chapter 3- § 3.6 to 3.8

Reference Book(s):

1. John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.
2. M. Artin, Abstract Algebra, 2nd Ed., Pearson, 2011.
3. Joseph A Gallian, Contemporary Abstract Algebra, 4th Ed., Narosa, 1999.

Website and e-Learning Source(s):

1. https://www.pdfdrive.com/topics-in-algebra-inherstein-e34321263.html
2. https://algebra.com
3. https://nptel.com.

For Mapping with POs and PSOs:

	POS					**PSOS**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	3	2	3	1	3	3	3	2	1
CO2	3	3	2	3	1	3	3	2	3	1
CO3	3	3	2	3	2	3	3	3	2	1
CO4	3	3	2	3	1	3	3	2	3	2
CO5	3	3	2	3	2	3	3	2	3	1

(For the candidates admitted from the academic year 2023-2024 onwards)

CORE IX – REAL ANALYSIS

Semester: V **Course Code:**

Hours: 5 (4L + 1T) **Credits : 5**

Pre-requisite: 12th Standard Mathematics

Course Objectives: To help the students to

1. Know about Real Numbers and properties of Real–valued functions.
2. Be familiar with open sets and closed sets.
3. Know the concepts of Connectedness, Compactness and Completeness of Metric spaces.
4. Understand the differentiability and the theorems on calculus.
5. Study the Convergence of sequences of functions and Taylor's theorem.

Course Outcomes: The students will be able to

CO1: Know and apply the concepts of Continuous and Discontinuous functions, open and close sets, Connectedness, Completeness and Compactness.

CO2: Explain the concepts of bounded and totally bounded sets, continuity of inverse functions and Uniform continuity.

CO3:Define the sets of measure zero, to explain the existence and properties of Riemann integral.

CO4:Understand the concepts of differentiability and theory and applications of Rolle's theorem, Law of mean, and Fundamental theorem of calculus.

CO5:Explain the pointwise and uniform convergence of sequence of function and to derive the Taylor's theorem.

UNIT I

Continuous Functions on Metric Spaces: Open sets – closed sets – Discontinuous function on R^1. **Connectedness, Completeness and Compactness:** More about open sets - Connected sets.

UNIT II

Bounded sets and totally bounded sets: Complete metric spaces - Compact metric spaces, continuous functions on a compact metric space, continuity of inverse functions, uniform continuity.

UNIT III

Calculus: Sets of measure zero, definition of the Riemann integral, existence of the Riemann integral - Properties of Riemann integral.

UNIT IV

Derivatives - Rolle's theorem, Law of mean, Fundamental theorems of calculus.

UNIT V

Taylor's theorem - Point wise convergence of sequences of functions, uniform convergence of sequences of functions.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. Richard R.Goldberg, "Methods of Real Analysis", (John Wiley & sons, 2nd edition) (Indian edition) – Oxford and IBH Publishing Co, New Delhi, 2020.

   Unit 1: Chapter 5 - § 5.1, 5.3 to 5.6, Chapter 6 – § 6.1, 6.2

   Unit 2: Chapter 6 - § 6.3 to 6.8

   Unit 3: Chapter 7- § 7.1 to 7.4

   Unit 4: Chapter 7- § 7.5 to 7.8

   Unit 5: Chapter 8 - § 8.5, Chapter 9 – § 9.1, 9.2

Reference Book(s):

1. Principles of Mathematical Analysis by Walter Rudin, Tata McGraw Hill Education, Third edition (1 July 2017).
2. Mathematical Analysis Tom M A postal, Narosa Publishing House, 2nd edition (1974), Addison-Wesley publishing company, New Delhi.

Website and e-Learning Source(s):

1. https://www.pdfdrive.com
2. https://analysis.com
3. https://nptel.com.

For Mapping with POs and PSOs:

	POS					**PSOS**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	3	1	3	1	3	2	3	2	1
CO2	3	3	1	3	1	3	2	2	1	1
CO3	3	3	1	3	1	3	2	3	1	1
CO4	3	3	1	3	1	3	2	2	1	2
CO5	3	3	1	3	1	3	2	2	1	1

(For the candidates admitted from the academic year 2023-2024 onwards)

CORE X – MATHEMATICAL MODELLING

Semester : V **Course Code :**

Hours : 6 (5L + 1T) **Credits : 5**

Pre-requisite: 12th Standard Mathematics

Course Objectives: To help the students to enable to

1. Know the Construction and Analysis of Mathematical models found in real life problems.
2. Formulate the mathematical modelling through differential equations.
3. Modelling using ordinary differential equations.
4. Introduce difference equations.
5. Study various models using difference equations.

Course Outcomes: The students will be able to

CO1: Explain simple situations requiring Mathematical Modelling and to determine the characteristics of such models.

CO2: Know the Models using differential equations in-terms of linear growth a decay models.

CO3: Understand the Models using systems of ordinary differential equations of first order, to discuss about various models under the categories 'Epidemics' and 'Medicine'.

CO4: Explain in detail about difference equations.

CO5: Apply difference equations in modeling.

UNIT I

Mathematical Modelling: Simple situations requiring mathematical modelling, characteristics of mathematical models.

UNIT II

Mathematical Modelling through differential equations: Linear Growth and Decay Models. Non-Linear growth and decay models, Compartment models.

UNIT III

Mathematical Modelling, through system of Ordinary differential equations of first order: Prey-predator models, Competition models, Model with removal and model with immigrations. Epidemics: simple epidemic model, Susceptible-infected- susceptible (SIS) model, SIS model with constant number of carriers. Medicine: Model for Diabetes Mellitus.

UNIT IV

Mathematical Modeling through difference equations: The need for Mathematical modelling through difference equations: Some simple models – Basic theory of Linear Difference Equations with constant coefficients.

UNIT V

Mathematical Modeling through difference equations: Harrod Model, cob web model, application to Actuarial Science.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. J.N.Kapur, "Mathematical Modeling", New Age International Publishers, 2005.

Unit 1: Chapter 1- § 1.1 to 1.4, 1.6,1.7

Unit 2: Chapter 2 - § 2.1 to 2.4

Unit 3: Chapter 3 - § 3.1, 3.2

Unit 4: Chapter 5 - § 5.1 to 5.2

Unit 5: Chapter 5 - § 5.3

Reference Book(s):

1. Mathematical Modeling by Bimalk. Mishra and Dipak K.Satpathi. Ane Books Pvt. Ltd (1 Januuary 2009).
2. Mathematical Modeling Models, Analysis and Applications, by Sandip Banerjee, CRC Press, Taylor & Francis group, 2014.
3. Mathematical Modeling applications with Geogebra by Jonas Hall & Thomas Ligefjard, John Wiley & Sons, 2017.
4. Mark M. Meerschaert: Mathematical Modeling, Elsevier Publ., 2007.
5. Edward A. Bender: An introduction to mathematical Modeling, CRC Press,2002.
6. Walter J. Meyer, Concepts of Mathematical Modeling, Dover Publ., 2000.

Website and e-Learning Source(s):

1. https://www.pdfdrive.com
2. https://nptel.com.

For Mapping with POs and PSOs:

	POS					**PSOS**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	2	3	3	3	2	2	2	3	2	1
CO2	2	3	3	3	2	2	2	2	3	1
CO3	2	3	3	3	2	2	2	3	2	1
CO4	3	2	2	2	1	2	2	2	3	2
CO5	2	2	3	3	2	2	2	2	3	1

(For the candidates admitted from the academic year 2023-2024 onwards)

CORE XI – OPERATIONS RESEARCH

Semester: V **Course Code:**

Hours : 5 (4L + 1T) **Credits : 5**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To introduce the various techniques of Operations Research.
2. To formulate the L.P.P and solve the L.P.P by graphical and simplex methods.
3. To introduce the artificial variables and the methods to solve L.P.P.
4. To solve transportation and assignment problems.
5. To make the students solve real life problems in Business and Management.

Course Outcomes: The students will be able to

CO1: Formulate the L.P.P and solve the L.P.P by graphical and simplex methods.

CO2: Understand the necessity of introducing artificial variables and develop skills in solving Big-M Method and Two-phase Method.

CO3: Know the methods of solving transportation and assignment problems.

CO4: Gain the knowledge of sequencing the jobs and understand the replacement policies to replace the machineries.

CO5: To solve networks scheduling problems by PERT / CPM.

UNIT I

Operation Research an Overview: Introduction – Origin and development of O.R-Nature and features of OR -Applications of OR - Linear programming problem - Introduction - Mathematical formulation – Illustrations on Mathematical formulation on Linear Programming Problems – Graphical solution method - some exceptional cases - Canonical and standard forms of Linear Programming Problem – Simplex method.

UNIT II

Use of Artificial Variables (Big M method - Two phase method) - Assignment problem - Solution methods of assignment problem – special cases in assignment problem.

UNIT III

Transportation problem - LP formulation of the TP - Solution of a TP - Finding an initial basic feasible solution (NWCM - LCM - VAM) – Degeneracy in TP - Transportation Algorithm (MODI Method).

UNIT IV

Sequencing Problem: Introduction –Problem of sequencing – Basic terms used in sequencing –Processing n jobs through two machines and three machines' Problems only – Replacement policy when value of money does not change with time – Replacement policy when value of money changes with time – Replacement of equipment that fails suddenly- Group replacement policy (Problems only).

UNIT V

PERT and CPM – Basic components – logical sequencing - Rules of network construction- Critical path analysis - Probability considerations in PERT.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s) :

1. Kanti Swarup, P.K. Gupta and Man Mohan, "Operations Research", 13th edition, Sultan Chand and Sons, 2007.
   Unit I: Chapter 1 - § 1.1 to 1.3, 1.10, Chapter 2 - § 2.1 to 2.4,
   Chapter 3 – § 3.1 to 3.5, Chapter 4 - § 4.1 and 4.3
   Unit II: Chapter 4 – § 4.4, Chapter 11 – § 11.1 to 11.4
   Unit III: Chapter 10 – § 10.1, 10.2, 10.5, 10.8, 10.9,10.10 10.12 and 10.13
   Unit IV: Chapter 12- § 12.1 to 12.5,
   Chapter 18 – § 18:1,18:2-18:2.1,18:2.2,18:3
   Unit V: Chapter 25 – § 25.1 to 25.7.

Reference Book (s):

1. Sundaresan.V, Ganapathy Subramanian. K.S. and Ganesan.K, Resource Management Techniques, A.R. Publications, 2002.
2. Taha H.A., Operations Research: An introduction, 7th edition, Pearson Prentice Hall, 2002.

Website and e-Learning Source(s):

1. https://www.pdfdrive.com
2. https://nptel.com.

For Mapping with POs and PSOs:

	POS					**PSOS**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	1	3	2	3	3	2	3	2	1
CO2	2	1	3	1	3	3	2	2	3	1
CO3	3	2	3	1	3	3	2	3	2	1
CO4	1	2	3	2	3	3	2	2	3	2
CO5	3	1	2	3	3	3	2	2	3	1

(For the candidates admitted from the academic year 2023-2024 onwards)

Discipline Specific Elective-DSE III:

NUMERICAL METHODS WITH APPLICATIONS

Semester: V **Course Code:**

Hours : 5 (4L + 1T) **Credits : 4**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To Introduce Numerical techniques to solve algebraic and transcendental equations.
2. To solve numerical problems using interpolation.
3. To know about numerical differentiation and integration.
4. To solve differential equations using the method of successive approximations
5. To develop skills in solving problems using numerical techniques.

Course Outcomes: The students will be able to

CO1: Find the approximate solution of differential equations using different numerical techniques.

CO2: Know varies interpolation methods to solve the problems.

CO3: Practice different methods to solve problems in numerical differentiation and numerical integration.

CO4; Solve differential equations using the method of successive approximations.

CO5: Solve differential equations using Runge-Kutta Methods and Milne's Method.

UNIT I

Algebraic and Transcendental Equations: Introduction - Iteration method - Bisection method – Regula-Falsi Method - Newton-Raphson method.

UNIT II

Finite differences: Introduction-Difference Operators (up to fundamental theorem for finite differences)-Interpolation-Introduction – Newton's interpolation Formulae - Central Difference Interpolation Formulae - Gauss Forward Interpolation Formula - Gauss Backward Interpolation Formula - Lagrange's interpolation formula.

UNIT III

Numerical differentiation and Integration: Introduction - Derivatives using Newton's forward difference formula - Derivatives using Newton's backward difference formula - Numerical Integration - Newton–Cote's quadrature formula - Trapezoidal rule - Simpson's one third rule - Simpson's 3/8 rule. (Errors in these rules are not included).

UNIT IV

Numerical solution of Ordinary Differential Equations: Introduction - Taylor's series method - Picard's method of successive approximations - Euler Method - Modified Euler method.

UNIT V

Numerical solution of Ordinary Differential Equations (Continued): Runge -Kutta methods (First order, second order, third order, fourth order) - Predictor corrector methods - Milne's method.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. S.Arumugam, A. Thangapandi Isaac, A.Somasundaram, "Numerical Methods", Second Edition, SciTech Publications (India)Pvt.Ltd., Chennai, 2010.

   Unit I: Chapter 3 - § 3.0, 3.2-3.5.

   Unit II: Chapter 6 - § 6.0, 6.1(up to fundamental theorem for finite Differences: pages160-166),

   Chapter 7 - § 7.0, 7.1, 7.2 (i, ii), 7.3.

   Unit III: Chapter 8 - § 8.0 - 8.2, 8.5 (3 Methods only).

   Unit IV: Chapter10 - § 10.0 -10.3.

   Unit V : Chapter10 - §10.4 - 10.6.

Reference Book(s):

1. S.S.Sastry, "Introductory Methods of Numerical Analysis", Fifth Edition, Prentice Hall of India private limited, NewDelhi,2013.
2. M.K. Venkatraman, "Numerical methods in Science and Engineering", National Publisher Company, Fifth Edition, 2001.

Website and e-Learning Source(s):

1. https://www.pdfdrive.com
2. https://nptel.com.

For Mapping with POs and PSOs:

	POS					**PSOS**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	1	3	2	3	3	2	3	2	1
CO2	2	1	3	1	3	3	2	2	3	1
CO3	3	2	3	1	3	3	2	3	2	1
CO4	1	2	3	2	3	3	2	2	3	2
CO5	3	1	2	3	3	3	2	2	3	1

(For the candidates admitted from the academic year 2023-2024 onwards)

Discipline Specific Elective–DSE-III
FUZZY SETS AND ITS APPLICATIONS

Semester: V **Course Code:**

Hours: 5 (4L + 1T) **Credits : 3**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To learn the basic concepts of fuzzy set theory.
2. To introduce concepts of fuzzy sets of type-K and Level-K.
3. To know the concepts of fuzzy relations and its projections.
4. To understand fuzzy logic and fuzzy relations.
5. To learn about fuzzy functions and the integration of fuzzy functions

Course Outcomes: Students will be able to:

CO1: Know the concepts of fuzzy sets and to relate certain aspects associated with fuzzy sets.

CO2: Understand the fuzzy sets of type-K and level-K

CO3: Gain knowledge about fuzzy relations and the projections of fuzzy relations

CO4: Understand fuzzy logic and fuzzy relations.

CO5: Know the concepts of fuzzy functions and able to integrate fuzzy functions

UNIT I

Fuzzy Set Theory: Concept of a Fuzzy Set – Relations between Fuzzy Sets – Operations on Fuzzy Sets- Properties of the Standard Operations – Certain Numbers Associated with a Fuzzy Set – Certain Crisp Sets Associated with a Fuzzy Set – Certain Fuzzy Sets Associated with a given Fuzzy Set – Extension Principle.

UNIT II

More Concepts Of Fuzzy Sets: Index of Fuzziness – Remarks on Extension Principle – Fuzzy Sets of Type–K and Level-K – Non Standard Operations on Fuzzy Sets - Generation of Membership Functions.

UNIT III

Fuzzy Relations: Fuzzy Relations – Operations on Fuzzy Relations – α –Cuts of a Fuzzy Relations - Compositions of Fuzzy Relations - Projections of Fuzzy Relations – Cylindric Extensions – Cylindric Closure - Fuzzy Relation on a Domain.

UNIT IV

Fuzzy Logic: Three -valued Logics – N-valued Logics for $N \geq 4$ – Infinite–valued Logics – Fuzzy Logics – Fuzzy Propositions and their Interpretations in terms of Fuzzy Sets – Fuzzy Rules and their Interpretations in terms of Fuzzy Relations – Fuzzy Inference or Approximate Reasoning – More on Fuzzy Inference - Generalizations of Fuzzy Logics.

UNIT V

Fuzzy Analysis: Fuzzy Functions on Fuzzy Sets - Extrema of Fuzzy Functions – Integration of Fuzzy Functions – Integration of a Fuzzy Function over a Crisp Interval - Integration of Real-Valued Function over a Fuzzy Interval – Fuzzy Differentiation.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. M.Ganesh, "Introduction to Fuzzy Sets And Fuzzy Logic", PHI Learning Private Limited, New Delhi, 2012.

   Unit I: Chapter 6 - § 6.2 to 6.9

   Unit II: Chapter 6 – Annexure - 6.1 to 6.5

   Unit III: Chapter 7 - § 7.2 to 7.9

   Unit IV: Chapter 8- § 8.2 to 8.10

2. H.J.Zimmermann, "Fuzzy Set Theory and Its Applications", Fourth Edition, New Delhi.

   Unit V: Chapter7- § 7.1 to 7.4

Reference Book(s):

1. Kaufmann.A. Introduction to the theory of fuzzy subsets, Vol.1, Academic Press, New York, 1975.
2. Klir.G.J. and B.Yuan, Fuzzy sets and Fuzzy Logic: Theory and Applications, Prentice Hall, Upper Saddle River,N.J.,1995.

Website and e-Learning Source(s):

1. https://onlinelibrary.wiley.com
2. https://nptel.com.

For Mapping with POs and PSOs:

	POS					**PSOS**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	2	2	3	2	3	3	2	3	2	1
CO2	3	2	3	1	3	3	2	2	3	1
CO3	3	2	3	1	3	3	2	3	2	1
CO4	2	2	3	2	3	3	2	2	3	2
CO5	3	3	2	3	3	3	2	2	3	1

(For the Candidates admitted from the academic year 2023-2024 onwards)

CORE XII: LINEAR ALGEBRA

Semester : VI **Course Code :**

Hours : 6 (5L+1T) **Credits : 6**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To Introduce the concepts of Vector Spaces, Dual spaces
2. To develop working knowledge on Bases and Dimension of basis
3. To learn about Matrix representation and the notion of dual spaces.
4. To apply the concepts for diagonalisation.
5. To apply Gram Schmidt Orthogonalization Process to problems on inner product spaces.

Course Outcomes: The students will be able to

CO1: Acquire a detailed knowledge about vector spaces and subspaces.

CO2: Explain the concepts of Linear Dependence, Linear Independence, Bases and Dimension of basis.

CO3: Explain the concept of Linear Transformations, their Matrix representation and the notion of dual spaces.

CO4: Find the Eigen values and Eigen vectors, to apply the concepts for diagonalisation.

CO5: Explain about Inner product and norms and to apply Gram Schmidt Orthogonalization Process to problems on inner product spaces.

UNIT I

Vector spaces – Subspaces – Linear Combinations and linear span - Systems of Linear equations – Homogenous Equations – Non-homogenous Equations – Elementary Matrices – Row reduced - Echelon form.

UNIT II

Linear Dependence and Linear independence – Bases – Dimensions.

UNIT III

Linear transformations, null spaces and ranges – Matrix representation of a linear transformation –invertibility and isomorphisms – dual spaces.

UNIT IV

Eigen values, eigen vectors, diagonalizability – invariant subspaces – Cayley–Hamilton theorem.

UNIT V

Inner products and norms – Gram Schmidt Orthogonalization Process - Orthogonal complements.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. Stephen H Friedberg, Arnold J Insel and Lawrence E Spence, "Linear Algebra", 4th Edition, 2011.

   Unit I : Chapter 1 - § 1.1 to 1.4, Chapter 3 -§ 3.1

   Unit II: Chapter 1 – § 1.5 to 1.6

   Unit III: Chapter 2 -§ 2.1,2.2,2.4 and 2.6

   Unit IV: Chapter 5- § 5.1 to 5.4

   Unit V : Chapter 6- § 6.1 to 6.2.

Reference Book(s):

1. I.N.Herstein, Topics in Algebra, Wiley Eastern Ltd. Second Edition, 2006.
2. N.S.Gopalakrishnan, University Algebra, New Age International Publications, Wiley Eastern Ltd.
3. John B.Fraleigh, First course in Algebra, Addison Wesley.
4. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Linear Algebra, 4th Ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2004.
5. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007.
6. S. Lang, Introduction to Linear Algebra, 2nd Ed., Springer, 2005.
7. Gilbert Strang, Linear Algebra and its Applications, Thomson, 2007.

Website and e-Learning Source(s):

1. https://nptel.ac.in

For Mapping with POs and PSOs:

	POs					PSOs				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	3	2	3	-	3	3	1	2	1
CO2	3	3	3	3	-	3	3	1	3	1
CO3	3	3	2	3	1	3	3	1	2	1
CO4	3	3	3	3	-	3	3	1	3	2
CO5	3	3	3	3	1	3	3	1	3	1

(For the Candidates admitted from the academic year 2023-2024 onwards)

CORE XIII: COMPLEX ANALYSIS

Semester : VI **Course Code :**

Hours : 6 (5L+1T) **Credits : 5**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To Introduce the concept of analytic functions
2. To Introduce the concept of Conformal mappings
3. To learn about the integrations of functions
4. To understand the convergence of sequences and series,
5. To learn about the real improper integrals

Course Outcomes: Students will be able to

CO1: Explain about analytic functions, their differentiation and continuity and to verify the Harmonic functions using analyticity conditions

CO2: Explain the concept of Conformal mappings and mappings by linear transformations and linear fractional transformations

CO3: Explain about the integrations of functions over simply and multiply connected domains and to derive the Cauchy integral formula, Liouvlle's theorem, Fundamental theorem of Algebra and Maximum Module Principle

CO4: Find the convergence the sequences and series, to derive Taylor's and Laurent's series

CO5: Find the nature of singularities, to find the residue of a given function at a given singular point, to Explain about zeros and poles and to evaluate real improper integrals (Excluding poles on the real axis)

UNIT I

Analytic functions: Functions of a Complex variable – Limits – Theorem on limits – Continuity – Derivatives – Differentiation formulas – Cauchy Riemann equation – conditions for differentiability – Polar coordinates – Analytic functions– Harmonic functions.

UNIT II

Conformal mapping: Mappings – Mapping by exponential function – Linear transformation – The transformation $w=\frac{1}{z}$ – Mappings by $\frac{1}{z}$ – Linear fractional transformations (bilinear)

UNIT III

Complex Integration: Contour integrals – Some examples – Simply and multiply connected domains – Cauchy integral formula – Formula for derivatives – Liouville's theorem – Fundamental theorem of Algebra – Maximum modulus principle.

UNIT IV

Sequences and Series: Convergence of sequences – Convergence of series – Taylor's series – Laurent series – Absolute and uniform convergence of power Series – Continuity of sums of power series – Integration & differentiation of power series.

UNIT V

Residues and Poles: Isolated singular points – Residues – Cauchy Residue theorem – Residue at infinity – The three types of isolated singular points – Residues at poles – Zeros of analytical functions – Zeros and poles – Evaluation of real improper integrals (excluding poles on the real axis).

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. James Ward Brown and Ruel V. Churchill, "Complex variables and application", Seventh Edition, Mc-Graw Hill Book Co., International Edition, 2009.

   Unit I : Chapter 2 - § 2.1, 2.4, 2.5, 2.7 to 2.14

   Unit II: Chapter 2 – § 2.2 to 2.3, Chapter 8 - § 8.1 to 8.4

   Unit III: Chapter 2 -§ 4.3, 4.4, 4.8 to 4.12

   Unit IV: Chapter 5- § 5.1 to 5.7

   Unit V : Chapter 6- § 6.1 to 6.7.

Reference Book(s):

1. Theodore W. Gamelan, Complex Analysis, Springer Verlag, 2008
2. Joseph Bak and Donald J. Newman, Complex analysis, 2nd Ed., Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., New York, 1997.
3. Richard A. Silverman, Introductory Complex Analysis. Dover Publications, 1972.
4. S. Ponnusamy and H. Silverman, Complex variables with applications, Birkhauser, 2006.

Website and e-Learning Source(s):

1. https://nptel.ac.in.

For Mapping with POs and PSOs:

	POs					PSOs				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	3	3	2	1	3	3	2	2	1
CO2	3	3	3	2	1	3	3	2	3	1
CO3	3	3	3	2	1	3	3	2	2	1
CO4	3	3	3	2	1	3	3	2	3	2
CO5	3	3	3	2	1	3	3	2	3	1

(For the Candidates admitted from the academic year 2023-2024 onwards)

CORE XIV: MECHANICS

Semester : VI **Course Code :**

Hours : 5 (4L +1T) **Credits : 5**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To Introduce the concepts of Coplanar forces, Equilibrium of a Particle
2. To apply Forces acting along a Triangle and Solve problems on frictional forces.
3. To learn about Simple Harmonic Motion
4. To understand the concept of Projectile, path of a projectile.
5. To study central orbits, and solve problems related to central orbits.

Course Outcomes: The students will be able to

CO1: Define Resultant, Component of a Force, Coplanar forces, like and unlike parallel forces, Equilibrium of a Particle, Limiting equilibrium of a particle on an inclined plane.

CO2: Define Moment of a force and Couple with examples. Define Parallel Forces and Forces acting along a Triangle, Solve problems on frictional forces

CO3: Define work, energy, power, rectilinear motions under varying forces. Define Simple Harmonic Motion and find its Geometrical representation.

CO4: Define Projectile, impulse, impact and laws of impact. Prove that the path of a projectile is a parabola. Find the direct and oblique impact of smooth elastic spheres

CO5: Define central orbits, explain conic as centered orbits and solve problems related to central orbits

UNIT I

Force: Newton's laws of motion – Resultant of two forces on a particle - **Equilibrium of a Particle:** Equilibrium of a particle – Limiting equilibrium of a particle on an inclined plane.

UNIT II

Forces on a Rigid Body: Moment of a Force – General motion of a rigid body – Equivalent systems of forces - Parallel Forces – Forces along the sides of a Triangle - **A specific reduction of Forces:** Reduction of coplanar forces into a force and couple – Problems involving frictional forces.

UNIT III

Work, Energy and Power: Work – Conservative field of force – Power - **Rectilinear Motion under Varying Force:** Simple Harmonic Motion – S.H.M. along a horizontal line – S.H.M. along a vertical line.

UNIT IV

Projectiles: Forces on a projectile – Projectile projected on an inclined plane.

UNIT V

Central Orbits: General orbits – Central orbit – Conic as a centered orbit.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. P.Duraipandian, Laxmi Duraipandian, Muthamizh Jayapragasam, "Mechanics" Reprint 2018, S.Chand and Company Limited, New Delhi.

Unit I : Chapter 2 - § 2.1, 2.2
Chapter 3 - § 3.1, 3.2
Unit II : Chapter 4 - § 4.1 to 4.5
Chapter 5 - § 5.1, 5.2
Unit III: Chapter 11- § 11.1 to 11.3
Chapter 12 - § 12.1 to 12.3
Unit IV: Chapter 13 - § 13.1, 13.2
Unit V : Chapter 16 - § 16.1 to 16.3

Reference Book(s):

1. Dr.M. K. Venkatraman, Statics, Sixteenth Edition, Agasthiar Publications, 2013.
2. Dr. M.K. Venkatraman, Dynamics, Sixteenth Edition, Agasthiar Publications, 2014.
3. J.L. Meriam and L. G. Kraige, Engineering Mechanics: Statics, Seventh Edition, Wiley and sons Pvt ltd., New York, 2012.
4. J.L. Meriam, L. G. Kraige, and J.N. Bolton, Engineering Mechanics: Dynamics, 8th edn, Wiley and sons Pvt ltd., New York, 2015.
5. A. K. Dhiman, P. Dhinam and D. Kulshreshtha, Engineering Mechanics (Statics and Dynamics), McGraw Hill Education (India) Private Limited, New Delhi, 2015.

Website and e-Learning Source(s):

1. https://nptel.ac.in.

For Mapping with POs and PSOs:

	POs					PSOs				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	2	3	2	1	3	3	2	2	1
CO2	3	2	3	2	1	3	3	2	3	1
CO3	3	2	3	2	1	3	3	2	2	1
CO4	3	2	3	2	1	3	3	2	3	2
CO5	3	2	3	2	1	3	3	2	3	1

(For the Candidates admitted from the academic year 2023-2024 onwards)

CORE XV: TRANSFORMS TECHNIQUE

Semester: VI **Course Code :**
Hours: 6 (5L+1T) **Credits : 5**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To Introduce the concepts of Laplace Transform.
2. To Introduce the concepts of Inverse Laplace Transform
3. To apply the technique in solving differential equations.
4. To learn about Fourier Transforms.
5. To understand the concept of Z-Transforms.

Course Outcomes: Students will be able to

CO1 : Ability to compute the Laplace Transform of the function.
CO2 : Evaluate inverse of Laplace transforms by the method of convolution.
CO3 : Summarize the concept of Laplace transforms to the solution of Differential equations.
CO4 : Ability to compute Fourier Transform and inverse Fourier transform of the function.
CO5 : Apply the concept of Z-Transforms in evaluation.

UNIT I

The Laplace Transform: Definition of Integral Transform – Definition of Laplace Transform – Linearity property - Piecewise continuous functions – Existence of Laplace Transform – Functions of Exponential order - A function of class A - Examples – Shifting theorems- Change of scale property – Examples – Laplace transform of the derivative , nth order derivative of F(t) – Initial value theorem – Final value theorem – Laplace transform of Integrals – Multiplication by t, t^n – Division by t – Examples.

UNIT II

The Inverse Laplace Transform: Inverse Laplace Transform – Null Function – Lerch's Theorem – Linearity Property, Examples - Shifting theorems- Change of scale property – Use of Partial Fraction, Examples – Inverse Laplace Transform of Derivatives – Inverse Laplace transform of Integrals – Multiplication, Division by powers of p.

UNIT III

The Inverse Laplace Transform(Ctd.): Definition of Convolution – Convolution theorem – Heaviside's expansion theorem – The Beta function – Examples – **Application of Laplace Transform to solutions of Differential Equations:** Solution of Ordinary Different Equations with Constant Coefficients, Examples.

Unit IV

Fourier Transforms: Dirichlet's Conditions - Fourier Integral Formula - Complex Fourier Transform - Inversion Theorem for complex Fourier transform - Fourier Sine Transform - Inversion Formula for Fourier Sine Transform - Fourier Cosine Transform -

Inversion Formula for Fourier Cosine Transform - Linearity Property of Fourier Transform - Change of Scale Property - Shifting Property - Modulation Theorem – Examples.

Unit V

Z-Transforms: Introduction – Definition – Some Standard Z-Transforms- Linearity Property – Some standard Results – Shifting U_n to the right – Multiplication by n – Two Basic Theorems.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. A.R.Vasishtha, R.K. Gupta, "Integral Transforms" by Thirty Fourth Edition 2015, Krishna Prakashan Media(P) Ltd., India.
   - Unit I : Chapter 1 – § 1.1 to 1.19
   - Unit II: Chapter 2 - § 2.1 to 2.13
   - Unit III: Chapter 2 - § 2.14 to 2.17 and Chapter 3 - § 3.1
   - Unit IV: Chapter 6 - § 6.1 to 6.15
2. B.S.Grewal and J.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 42nd Edition, 2012.
   - Unit V : Chapter 23 - § 23.1 to 23.9

Reference Book(s):

1. A.N. Srivastava, Mohammad Ahmad, "Integral Transforms and Fourier Series", Narosa Publications, 2012.
2. J.K.Goyal, K.P.Gupta, G.S.Gupta, "Laplace's & Fourier Transforms", Anu Books, 2020.
3. G.Shanker Rao, "Mathematical Methods", I.K. International Publications, 1st Edition, 2009.
4. Dr. Pratiksha Saxena, School of Applied Sciences, GBU, Greater Noida Vikas Publishing House
5. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 10th Edition, 2010.

Website and e-Learning Source(s):

1. https://nptel.ac.in.

For Mapping with POs and PSOs:

	POs					PSOs				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	3	2	3	-	3	3	1	2	1
CO2	3	3	3	3	-	3	3	1	3	1
CO3	3	3	2	3	1	3	3	1	2	1
CO4	3	3	3	3	-	3	3	1	3	2
CO5	3	3	3	3	1	3	3	1	3	1

*(**For the Candidates admitted from the academic year 2023-2024 onwards)***

Discipline Specific Elective-DSE-IV

ASTRONOMY

Semester : VI **Course Code :**

Hours : 5 (4L + 1T) **Credits : 3**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To Introduce the concepts of spherical Trigonometry.
2. To understand Astronomical refraction.
3. To learn about parallax in Astronomy
4. To understand anomalies of the Earth
5. To learn about the Characteristics of Moon, Stars and Eclipses.

Course Outcomes:

CO1: Understand and apply basic computational technique to solve problems in astronomy and interpret the results.

CO2: To apply fundamental principles and techniques of astronomy.

CO3: To Acquire knowledge of the Physical universe and its evolution.

CO4: Acquire a detailed knowledge about Astronomy.

CO5: Explain the concepts of parallax.

UNIT I

Formula for spherical Trigonometry (all without proof) – Cosine formula – Sine formula – Cotangent formula – Five parts formula - Celestial Sphere – Diurnal motion – celestial co-ordinates – sidereal times – Morning and evening stars – Circumpolar stars.

UNIT II

Dip of Horizon – Effects of Dip – Twilight – Civil, Nautical & Astronomical twilights - Refraction - Laws of Refraction - Astronomical refraction – Tangentand Cassini's formula for refraction- Horizontal refraction.

UNIT III

Geocentric parallax – Parallax – Effects of Geocentric Parallax – Angular diameter – Equatorial Horizontal Parallax - Kepler's laws of planetary motion – Verification of Kepler's Laws (1) and (2) in the case of the earth – Explanation of the third law - Newton's deductions from Kepler's Laws – Derivation of Kepler's third law – Mass of the Planet.

UNIT IV

The position of the planet – Mean anomaly – True anomaly – Eccentric anomaly - Three anomalies of the Earth and relations between them – Equation of time - Stationary values of equation of time – Seasons – Causes of seasons.

UNIT V

The Moon – Sidereal month – Synodic Month – Elongation – Age of moon Phase of moon - Successive phases of moon – Lunar Librations – Path of themoon with respect to the sun – Harvest moon – Hunter's moon – Metonic Cycle - Golden numbers, Epact – Surface structure of moon – Lunar mountains – Earth shine - Eclipses – Umbra & Penumbra – Lunar Eclipse – Solar Eclipse –Major & Minor Ecliptic limits.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s) :

1. Prof. Kumaravelu and Prof. Sushseela Kumaravelu, "Astronomy", Revised and enlarged edition, 2013.

   Unit I : Chapter 1 - § 21 to 23, 25 (All without Proof),
   Chapter 2 - § 39 to 63, 66 to 83

   Unit II : Chapter 3 - § 106 to 116, Chapter 4 - § 117 to 133

   Unit III : Chapter 5 - § 135 to 145, Chapter 6 - § 146, 149 to 151, 153 to 155

   Unit IV : Chapter 6 - § 156 to 165,Chapter 7 - § 166 to 174

   Unit IV : Chapter 12 - § 229 to 245, 249 to 250, 252 to 254,
   Chapter 13 - § 256 to 263, 267 to 270

Reference Book(s) :

1. "Astronomy" by Prof . Sirajudeen.

Website and e-Learning Source(s):

1. https://nptel.ac.in.

For Mapping with Pos and PSOs :

	POs					**PSOs**				
	1	2	3	4	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	3	2	3	-	3	3	1	2	1
CO2	3	3	3	3	-	3	3	1	3	1
CO3	3	3	2	3	1	3	3	1	2	1
CO4	3	3	3	3	-	3	3	1	3	2
CO5	3	3	3	3	1	3	3	1	3	1

(For the Candidates admitted from the academic year 2023-2024 onwards)

Discipline Specific Elective-DSE-IV

DISCRETE MATHEMATICS

Semester: VI **Course Code :**

Hours : 5 (4L+1T) **Credits : 3**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To Introduce the concepts of Recurrence Relations.
2. The learn about Recursive and Partial Recursive functions.
3. To apply the knowledge of the formal languages in encoding and decoding of messages.
4. To understand the application of Lattices and Boolean algebra in compiling techniques.
5. To learn about Encode & Decode messages through formal languages.

Course Outcomes:

CO1: Acquire a detailed knowledge about recurrence relations.

CO2: Explain Recursive and Partial Recursive functions.

CO3: Explain the kinds of Lattices

CO4: Construct compiling techniques based on lattices & Boolean algebra.

CO5: Encode & Decode messages through formal languages.

UNIT I

Recurrence relations – Recurrence – An introduction, Polynomials and their Evaluations-Recurrence Relations – Solution of finite order Homogeneous (linear) relations – Solution of Non-homogeneous Relations.

UNIT II

Generating functions – Some common Recurrence Relations – Primitive Recursive functions – Recursive and Partial Recursive functions.

UNIT III

Lattices – Some properties of Lattices-New Lattices - Modular and distributive Lattices.

UNIT IV

Boolean Algebra – Boolean Polynomials – Karnaugh Map.

UNIT V

Coding theory – Introduction - Hamming distance - Encoding a message – group codes-procedure for generating group codes - decoding and error correction - an example of a single error correcting code.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. M.K.Venkatraman., N.Sridharan and N.Chandrasekaran, "Discrete Mathematics", The National Publishing Company, September 2007.

   Unit I : Chapter 5 - § 1 to 5
   Unit II : Chapter 5 - § 6 to 9
   Unit III : Chapter 10 - § 1 to 4
   Unit IV : Chapter 10 - § 5 to 7
   Unit IV : Chapter 8 - § 1 to 7

References:

1. J.P.Tremblay and R.Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw Hill book Company, 2000.
2. J.E.Hop Croft and J.D.Willman, Introduction to Automata Theory, Nicosia Publishing House, 1986.
3. C.L.Liu, Elements of Discrete Mathematics, McGraw-hill Book Company, 2003.

Website and e-Learning Source(s):

1. https://nptel.ac.in.

For Mapping with POs and PSOs :

	POs					PSOs				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	2	3	2	1	3	3	2	2	1
CO2	3	2	3	2	1	3	3	2	3	1
CO3	3	2	3	2	1	3	3	2	2	1
CO4	3	2	3	2	1	3	3	2	3	2
CO5	3	2	3	2	1	3	3	2	3	1

(For the candidates admitted from the academic year 2023-2024 onwards)

GENERIC ELECTIVE I: DATA STRUCTURES

Semester : I **Course Code :**

Hours : 4 (3L + 1T) **Credits : 4**

Prerequisite: 12th Standard Mathematics

Course Objectives:

1. To understand the concepts of ADTs.
2. To Learn linear data structures – lists, stacks, and queues.
3. To understand non-linear data structures – trees and graphs.
4. To apply Tree and Graph structures.
5. To learn tree traversals.

Course Outcomes: The students will be able to

CO1: Define linear and non-linear data structures.

CO2: Implement linear and non–linear data structure operations.

CO3: Use appropriate linear/non–linear data structure operations for solving a given problem.

CO4: Apply appropriate graph algorithms for graph applications.

CO5: To do tree traversals.

UNIT I

Linear Data Structures- Introduction -Abstract Data Types (ADTs) -Stacks - Stack ADT Applications-implementation

UNIT II

Queues – Queues ADT – Exceptions- Applications - implementation.

UNIT III

Linked lists- Singly linked lists – Circularly linked lists – Doubly-linked lists

UNIT IV

Nonlinear Data Structures – Graphs -Applications- Graph Representation - Graph Traversals – Topological Sort

UNIT V

Trees – Binary Trees– Properties of Binary trees – Binary tree traversals- Binary Search Trees.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. Narasimha Karumanchi, "Data Structures and Algorithms Made Easy", 5TH Edition, Career Monk Publications, 2017.

Reference(s):

1. Langsam, Augenstein and Tanenbaum, Data Structures Using C and C++, 2nd Edition, Pearson Education, 2015.
2. Reema Thareja, Data Structures using C, Oxford University Press, 2015.

Website and e-Learning Source(s):

1.http://www.ictacademy.in/pages/Advanced-C-Programming.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	1	2	2	2	2	2	1	2	1
CO2	2	1	2	1	3	2	2	1	3	2
CO3	3	1	2	1	2	2	2	1	2	1
CO4	3	1	2	2	3	2	2	1	3	2
CO5	3	1	2	3	2	2	2	1	2	1

(For the candidates admitted from the academic year 2023-2024 onwards)

GENERIC ELECTIVE II: DATA STRUCTURES PRACTICALS

Semester : I **Course Code :**

Hours : 2 **Credits : -**

Prerequisite: 12th Standard Mathematics

Course Objectives: To

1. Understand the concepts of Data Structures.
2. Understand the concept of stacks.
3. Understand the concept of queues.
4. Understand the concept of trees.
5. To develop the ability to analyse a problem and develop an algorithm to solve it.

Course Outcomes: The students will be able to

CO1: apply the concept of stacks.

CO2: apply the concept of queues.

CO3: apply the concept of trees.

CO4: apply the concept of data structures, like trees, stacks and queues in the programming context.

CO5: interpret programming task involved for a given computational problem.

Practicals:

1. Given a stack sort it such that the top of the stack has the largest element. Read the size of the stack, followed by the numbers to be pushed to stack. The output should be the popped elements from the sorted stack.
2. Write a C program to use stack operations to convert infix expression into postfix expression.
3. Write a C program to use stack operations to evaluate a postfix expression.
4. A car washing garage has 2 gates one to enter, another to exit and can wash 3 cars at a time. Cars can enter the garage in one gate and exit in another gate. For this application, ask user to choose operations such as '1-insert car', '2-remove car', '3-show queue' or '4-quit'. Perform the following sequence of operations: 1 1; 1 2; 1 3;1 4; 2; 3; 4;
5. Write a C program for manipulating a doubly linked list as follows: Add a node after p, add a node before p, delete node p and traverse the list.

6. Given a directed graph detect if there is a cycle in the graph or not. Read 2 integers N and M which denote the number of vertices and number of edges respectively. Read M pairs u and v denoting that there is an unidirected edge from u to v. Print if there is a cycle or not.
7. Construct a binary tree and binary search tree. Find the traversals of binary tree and binary search tree and print the elements of both.

Website and e-Learning Source:

1. https://www.udemy.com/course/advanced-c-programming-course.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	2	1	2	2	2	2	2	1	2	1
CO2	2	1	2	1	3	2	2	1	3	2
CO3	2	2	2	1	2	2	2	1	2	1
CO4	1	2	2	2	3	2	2	1	3	2
CO5	3	1	2	3	2	2	2	1	2	1

(For the candidates admitted from the academic year 2023-2024 onwards)

GENERIC ELECTIVE III: BIO STATISTICS

Semester : II **Course Code :**

Hours : 4 (3L + 1T) **Credits : 4**

Prerequisite: 12th Standard Mathematics

Course Objectives:

1. To imbibe statistical techniques applicable in medical science.
2. To imbibe statistical techniques applicable in biology.
3. To estimate effective dose response relation.
4. To learn tests for non-validity.
5. To learn life distributions and failure rate.

Course Outcomes :

The students will be able to

CO1: apply statistical techniques in medical science and biology.

CO2: Estimate dose response relation.

CO3: Fit life distributions.

CO4: Estimate the failure rate.

CO5: Estimate survival function.

UNIT I

Bioassays: Quantitative and qualitative response – Dose response relation – Estimation of modern effective dose – Estimation of unknown concentration of potency - Probit and logit transformations.

UNIT II

Parallel line and slope ratio assay – Potency ratio – Feller's theorem – Tests for non validity – Symmetric and asymmetric assays.

UNIT III

Concepts of time, Order and random censoring, Likelihood in these cases. Life distributions – Exponential, Gamma and Linear Failure rate.

UNIT IV

Estimation of survival function – Acturial Estimator, Kaplan – Meier Estimator, Estimation under the assumptions of IFR / DFR. Two sample problem – Gehan test, Log rank test. Mantel – Haenszel test.

UNIT V

Clinical trials: Definition – Different types of clinical trials – informed consent – benefits and risks of participating in a clinical trial – Control and placebo – Phases of clinical trials – single and double blind test.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. Daniel, "Bio statistics – A foundation for analysis in health sciences", John Wiley, Third Edition.
2. Miller, R.G., "Survival analysis", John Wiley. 1981.

Reference Book(s):

1. Cox, D.R. and Oakes, D (1984): Analysis of Survival Data, Chapman and Hall, New York.

Website and e-Learning Source(s):

1. https://nptel.ac.in.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	1	2	3	4	5	3	2	1	1	1
CO2	3	1	3	-	-	3	2	1	1	1
CO3	2	1	3	-	-	3	2	1	1	1
CO4	3	2	3	2	-	3	2	1	1	1
CO5	3	2	3	2	1	3	2	1	1	1

(For the candidates admitted from the academic year 2023-2024 onwards)

Generic Elective IV: JAVA PROGRAMMING

Semester : III **Course Code :**
Hours : 3 (2L + 1T) **Credits : 5**

Pre-requisite: 12th Standard Programming Knowledge

Course Objectives:

1. To provide fundamental knowledge of object-oriented programming
2. To equip the student with programming knowledge in Core Java from the basics up.
3. To enable the students to use AWT controls, Event Handling and Swing for GUI.
4. To provide fundamental knowledge of object-oriented programming.
5. To equip the student with programming knowledge in Core Java from the basics up.

Course Outcomes:

CO1: Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.
CO2: Implement inheritance, packages, interfaces and exception handling of Core Java.
CO3: Implement multi-threading and I/O Streams of Core Java
CO4: Implement AWT and Event handling.
C05: Use Swing to create GUI.

UNIT I:

Introduction: Review of Object-Oriented concepts – History of Java – Java buzz words – JVM architecture – Data types - Variables - Scope and life time of variables - arrays - operators – control statements - type conversion and casting - simple java program - constructors - methods - Static block - Static Data – Static Method String and String Buffer Classes.

UNIT II:

Inheritance: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword.

Packages: Definition-Access Protection –Importing Packages.

Interfaces: Definition–Implementation–Extending Interfaces.

Exception Handling: *try* – *catch- throw - throws* – *finally* – Built-in exceptions - Creating own Exception classes.

UNIT III:

Multithreaded Programming: Thread Class - Runnable interface- Synchronization–Using synchronized methods– Using synchronized statement- Inter thread Communication –Deadlock.

I/O Streams: Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.

UNIT IV:

AWT Controls: The AWT class hierarchy - user interface components- Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout managers.

Event Handling: Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes

UNIT V:

Swing: Introduction to Swing - Hierarchy of swing components. Containers - Top level containers – J Frame – J Window – J Dialog – J Panel – J Button – J Toggle Button – J Check Box – J Radio Button – J Label, J Text Field – J Text Area – J List – J Combo Box – J Scroll Pane.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. Herbert Schildt, "The Complete Reference", Tata McGraw Hill, New Delhi, 7th Edition, 2010.
2. Gary Cornell, "Core Java2 Volume I – Fundamentals", Addison Wesley, 1999.

Reference Book(s):

1. Head First Java, O'Rielly Publications.
2. Y. Daniel Liang, *Introduction to Java Programming*, 7th Edition, Pearson Education India, 2010.

Website and e-Learning Source(s):

1. https://javabeginnerstutorial.com/core-java-tutorial.
2. http://docs.oracle.com/javase/tutorial/.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	2	3	1	3	3	2	1	1	3
CO2	3	2	3	1	3	3	2	1	2	3
CO3	3	3	3	3	3	3	3	1	2	3
CO4	3	3	3	3	3	3	3	1	2	3
CO5	3	3	3	3	3	3	3	1	2	3

(For the candidates admitted from the academic year 2023-2024 onwards)

Discipline Specific Elective-DSE-I

PROGRAMMING IN JAVA LAB

Semester: III **Course Code :**
Hours : 3 **Credits : 5**

Pre-requisite: 12th Standard Programming Knowledge

Course Objectives:

1. To provide fundamental knowledge of object-oriented programming.
2. To equip the student with programming knowledge in Core Java from the basics up.
3. To enable the students to know about Event Handling.
4. To enable the students to use String Concepts.
5. To equip the student with programming knowledge in to create GUI using AWT controls

Course Outcomes:

On completion of this course, students will

CO1: Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.

CO2: Implement inheritance, packages, interfaces and exception handling of Core Java.

CO3: Implement multi-threading and I/O Streams of Core Java

CO4: Implement AWT and Event handling.

CO5: Use Swing to create GUI.

List of Programs:

1. Write a Java Program to demonstrate constructors.
2. Write a Java program to practice using String class and its methods.
3. Implementing an exception called 'Marks out of Bounds Exception' that is thrown if entered marks greater than 100.
4. Write a java program to demonstrate Packages.
5. Write a program to demonstrate use of implementing interfaces.
6. Write a program to demonstrate use of extending interfaces.
7. Write a java program to demonstrate threads.
8. Write a java to implementing thread using runnable interface.
9. Installation of Tomcat Server.
10. Write a JSP Program to delete data in database.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. Herbert Schildt, "The Complete Reference", Tata McGraw Hill, New Delhi, 7th Edition, 2010.
2. Gary Cornell, "Core Java 2 Volume I – Fundamentals", Addison Wesley, 1999.

Reference Book(s):

1. Head First Java, O'Rielly Publications,
2. Y. Daniel Liang, *Introduction to Java Programming*, 7th Edition, Pearson Education India, 2010.

Website and e-Learning Source(s):

1. https://javabeginnerstutorial.com/core-java-tutorial.
2. http://docs.oracle.com/javase/tutorial/.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	2	3	1	3	3	2	1	1	3
CO2	3	2	3	1	3	3	2	1	2	3
CO3	3	3	3	3	3	3	3	1	2	3
CO4	3	3	3	3	3	3	3	1	2	3
CO5	3	3	3	3	3	3	3	1	2	3

(For the candidates admitted from the academic year 2023-2024 onwards)

Discipline Specific Elective-DSE-II

C PROGRAMMING

Semester: IV **Course Code:**

Hours: 4 **Credits : 4**

Pre-requisite: 12th Standard Programming Knowledge

Course Objectives:

1. To introduce the concepts of constants variables, data types, And input output operations.
2. To introduce the concepts of decision-making statements and looping.
3. To introduce the concepts of character arrays and strings.
4. To introduce the concepts of user defined functions.
5. To introduce the concepts of file Management in C.

Course Outcomes: The students will be able to

CO1: Implement different operations on arrays and Strings.

CO2; Understand decision making and looping.

CO3: Understand the basic concepts of computer programming in C.

CO4: Write Program using C for numerical computing.

CO5: Write Program using C for mathematical applications.

UNIT I

Constants, Variables and Data types - Character set – C tokens – Keywords and identifiers – Constants-Variables- Data types- Declaration of variables and storage class- Assigning values to variables **– Operators and Expressions** – Arithmetic Operators - Relational Operators – Logical Operators – Assignment Operators – Increment and Decrement Operators – Conditional Operator – Bitwise Operators – Special Operators – Arithmetic Expressions – Evaluation of Expressions – Precedence of Arithmetic Operators - **Managing input and output operations** – Reading a character – Writing a character –Formatted input – Formatted output.

UNIT II

Decision making and branching – Decision making with IF statement – simple IF statement - The IF ELSE statement – Nesting IF…ELSE statements – the ELSE IF ladder - The switch statement – The ?: operator – The GOTO statement – **Decision making and looping** – The WHILE, DO, FOR statements.

UNIT III

Arrays – One dimensional arrays – Declaration and initialization of one dimensional arrays - two dimensional arrays – initializing two dimensional arrays - multi dimensional arrays - **Character arrays and strings** – Declaring and initializing string variables – Reading strings from terminal – Writing strings to screen – Arithmetic operations on characters - Putting strings together – Comparison of two strings – String handling functions.

UNIT IV

User defined functions – Need for user defined functions – A multi-function program – Elements of user defined functions – Definitions of functions – Return values and their types-Function calls –Function declaration – Category of functions – No

arguments and no return values –Arguments but no return values- No arguments but returns a value – Functions that return multiple values – Nesting of functions – Recursion.

UNIT V

File Management in C – Defining and opening a file – Closing a file –Input / Output operations on files – Error handling during I/O operations - Random access to files.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. E.Balagurusamy, "Programming in ANSI C", Sixth Edition, Tata McGraw Hill Publishing Company Limited, 2015.

   UNIT I: Chapter 2 – § 2 to 10; Chapter 3 – § 2 to 12
   Chapter 4 – § 2 to 5.
   UNIT II: Chapter 5 – § 2 to 9, Chapter 6 – § 2 to 4.
   UNIT III: Chapter 7 – § 2 to 7, Chapter 8 – § 2 to 8.
   UNIT IV: Chapter 9 – § 2 to 16.
   UNIT V: Chapter 12 – § 2 to 6.

Reference Book(s):

1. B.W. Kernighan and D M.Ritchie, "The C Programming Language", 2nd Edition, PHI, 1988.
2. H. Schildt, "C: The Complete Reference", 4th Edition. TMH Edition, 2000.
3. Gottfried B.S, "Programming with C", Second Edition, TMH Pub. Co. Ltd., New Delhi 1996.
4. Kanetkar Y., "Let us C", BPB Pub., New Delhi, 1999.

Website and e-Learning Source(s):

1. https://ia802802.us.archive.org/15/items/The_C_Programming_Language/The_C_Programming_Language.pdf.
2. https://docs.google.com/file/d/0B3OzFFMgEP0tU3RVcmh2Wm5ZUWs/edit?resourcekey=0-wQuLS_uE4BCJL70xs-1JKQ.
3. https://www.codewithc.com/programming-with-c-pdf-byron-gottfried/.

For Mapping with POs and PSOs:

	POs					PSOs				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	2	3	2	3	1	2	3	3	1
CO2	2	1	3	1	3	3	2	2	3	1
CO3	1	2	2	1	3	3	2	3	2	1
CO4	1	3	2	3	3	2	2	2	3	2
CO5	3	1	2	3	3	2	2	3	3	1

(For the candidates admitted from the academic year 2023-2024 onwards)

AECC-III SSD – SOFT SKILLS DEVELOPMENT

Semester: V **Course Code:**

Hours: 2 **Credits : 2**

Prerequisite: 12th Standard

Course Objectives:

Today's world is all about relationship, communication and presenting oneself, one's ideas and the company in the most positive and impactful way. This course intends to enable students to achieve excellence in both personal and professional life.

UNIT I

Know Thyself/Understanding Self: Introduction to Soft skills discovery-Developing positive attitude-Improving Perceptions-Forming values.

UNIT II

Interpersonal Skills/Understanding Others: Developing interpersonal relationship-Team building-group dynamics-Networking improved work relationship.

UNIT III

Communication Skills/Communication with others: Art of listening – Art of reading –Art of speaking – Art of writing – Art of writing emails – email etiquette.

UNIT IV

Corporate Skills/Working with others: Developing body language – Practicing etiquette and mannerism – Time management – Stress management.

UNIT V

Selling Self/Job Hunting: Writing resume/cv-interview skills – Group discussion – Mock interview – Mock GD – Goal setting – Career planning.

Text Book(s):

1. Meena.K and V.Ayothi, "A Book on Development of Soft Skills (Soft Skills: A Road Map to Success)" P.R.Publishers & Distributors, 2013.
2. Alex K, "Soft Skills – Know Yourself & Know the World", S.Chand & Company Ltd, New Delhi, 2012.

Reference Book(s):

1. Developing the leader within you John c Maxwell.
2. Good to Great by Jim Collins.
3. The seven habits of highly effective people Stephen Covey.
4. Emotional Intelligence Daniel Goleman.
5. You can win Shiva Khera.
6. Principle centred leadership Stephen Covey.

(For the candidates admitted from academic year 2023 - 24 onwards)

FIRST ALLIED I: MATHEMATICS I

(For Physics and Chemistry Major)

Semester: I **Course Code:**

Hours : 4 (3L + 1T) **Credits : 4**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To introduce higher derivatives and to learn Leibnitz theorem and its applications.
2. To learn about vector differentiation, vector integration and applications.
3. To know about the concept of Reduction formulae.
4. To determine the line integrals of various functions.
5. To find surface and the volume integrals of the functions.

Course Outcomes: The students will be able to

CO1: Gain the knowledge and to work with the concepts of curvature.

CO2: Know the concept of vector algebra and vector analysis of a physical Quantities.

CO3: Evaluate the line integrals using properties of integration

CO4: Explain the surface and volume integrals.

CO5: Gain the knowledge of Reduction formulae.

UNIT I

Successive Differentiation: nth derivatives - standard results – Formation of equations involving derivatives.

UNIT II

Leibnitz formula (Statement only) for nth derivative of a product of two functions – simple problems - Cartesian formula for the radius of Curvature.

UNIT III

Integration: Reduction formulae for $x^n e^{ax}$, $sin^n x$, $cos^n x$, $sin^m x\ cos^n x$ - Evaluating the integrals of $sin^n x$, $cos^n x$, $sin^m x\ cos^n x$ from 0 to $\frac{\pi}{2}$.

UNIT IV

Gradient, Divergence and Curl: Partial derivatives of Vectors – The Vector differential operator DEL – Gradient of a scalar field – formulae involving gradient - Divergence of a vector point function – Curl of a vector point function.

UNIT V

Line Integrals: Some preliminary concepts – Line integrals - Surface integrals and Volume Integrals – Simple problems.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. T.K.Manicavachagom Pillay, and S.Narayanan, "Calculus Volume I", S.Viswanathan Pvt. Ltd., Reprint 2018.

   UNIT I : Chapter 3 – § 1.1 -1.4 & 1.6,

   UNIT II : Chapter 3 – § 2.1, Chapter 10 – § 2.3.

2. T.K.Manicavachagom Pillay, and S.Narayanan, "Calculus Volume II", S.Viswanathan Pvt. Ltd., 2013.

   UNIT III: Chapter 1 – § 13, 13.1-13.9.

3. A.R.Vasishta and A.K.Vasishta, "Vector Calculus", Krishna Prakashan Media, 2014.

   UNIT IV : Chapter 2 – § 2.1 - 2.4, & 2.8 - 2.9 .

   UNIT V : Chapter 3 – § 3.1 - 3.4.

Reference Book(s):

1. S. Arumugam and Issac, "Calculus, Volume I", New Gamma Publishing House, 1991.
2. P.R. Vittal and V. Malini, "Vector Calculus, Fourier series and Fourier transforms", Margham Publications, Reprint 2016.

Website and e-Learning Source(s):

1. https://nptel.ac.in
2. https://mathpages.com

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	1	1	3	2	3	1	2	3	2	1
CO2	2	1	2	1	3	2	1	2	3	1
CO3	1	2	2	1	3	2	2	3	2	1
CO4	1	2	2	2	3	2	2	3	2	2
CO5	2	1	2	3	2	2	1	2	2	1

(For the candidates admitted from academic year 2023 - 24 onwards)

FIRST ALLIED II: MATHEMATICS II

(For Physics and Chemistry Major)

Semester: II **Course Code:**

Hours: 4 (3L + 1T) **Credits : 2**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To study basic knowledge of series of Binomial.
2. To know about series of Exponential and Logarithmic.
3. To gain the knowledge of Cayley-Hamilton theorem.
4. To acquire knowledge on Expansions of trigonometric functions.
5. To learn Hyperbolic functions and Inverse hyperbolic functions.

Course Outcomes: The students will be able to

CO1: Learn about summation of series, matrices.

CO2: Study the expansions of trigonometric circular and hyperbolic functions.

CO3: Evaluate the rank of the matrix and Eigen values.

CO4: Explain the concepts of trigonometric functions.

CO5: Determine the Hyperbolic functions and Inverse hyperbolic functions.

UNIT I

Binomial theorem: Application for the Binomial theorem to the summation of series - Approximate values.

UNIT II

Exponential and Logarithmic Series: Summation of Exponential series - Summation of the Logarithmic series.

UNIT III

Matrices: Inverse of a Matrix – Rank of a Matrix – Characteristic equations – Eigen values only – Statement of Cayley-Hamilton theorem – Application of Cayley-Hamilton theorem.

UNIT IV

Expansions: Expansions of $\cos n\theta$, $\sin n\theta$ and $\tan n\theta$ – Powers of sines and cosines of θ in terms of functions of multiple of $n\theta$.

UNIT V

Hyperbolic functions: Hyperbolic functions - Inverse hyperbolic functions.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. T.K.Manicavachagom Pillay, T.Natarajan and S.Ganapathy, "Algebra Volume I", S.Viswanathan Pvt. Ltd., 2016.

   UNIT I : Chapter 3 - § 10, 14.

   UNIT II : Chapter 4 - § 3, 5, 7.

2. T.K.Manicavachagom Pillay, T.Natarajan and S.Ganapathy, "Algebra Volume II", S.Viswanathan Pvt. Ltd., 2016.

   UNIT III: Chapter 2 - § 8, 11, 16 (Page No.110), 16.3 (Page No.117-120).

3. T.K.Manicavachagom Pillay and S.Narayanan, "Trigonometry", S.Viswanathan Pvt. Ltd., 2015.

   UNIT IV: Chapter 3 - § 1, 2, 4, 4.1, 5, 5.1

   UNIT V : Chapter 3 - § 1, 2 (2.1 to 2.3)

Reference Book(s):

1. S.G. Venkatachalapathy, "Allied Mathematics", Margham Publication, 2011.
2. S.Narayanan, Hanumantha Rao, Manicavasagam Pillai, S. "Ancillary Mathematics Volume - I", S.Viswanathan Pvt Ltd, Madras, 2000

Website and e-Learning Source(s):

1. https://nptel.ac.in
2. https://mathpages.com

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	1	1	2	3	3	1	2	3	2	2
CO2	2	1	2	1	3	2	1	2	3	1
CO3	1	3	2	2	3	2	2	3	2	1
CO4	1	3	2	2	3	3	2	2	2	2
CO5	2	1	2	3	3	2	1	2	2	1

(For the candidates admitted from academic year 2023 - 24 onwards)

FIRST ALLIED III: MATHEMATICS III

(For Physics and Chemistry Major)

Semester : II **Course Code :**

Hours : 4 (3L + 1T) **Credits : 4**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To expose differential equations as a powerful tool in solving problems.
2. To study the methods used to solve differential equations of first order and second order.
3. To introduce Laplace transform techniques to solve ODE's.
4. To get the knowledge about Laplace Transforms.
5. To understand the various statistical methods by giving real life examples.

Course Outcomes:

CO1: Equations solvable for dy/dx, x and y.

CO2: Discuss and demonstrate the Linear Equations with constant coefficients, Complementary function and Particular integrals.

CO3: Understand Laplace transforms and discuss the Properties of Laplace transforms.

CO4: Define and illustrate the inverse Laplace transforms.

CO5: Understand the concept of Correlation &Gain the Knowledge of Regression.

UNIT I

Second order differential equations with constant coefficients – Particular integrals for e^{ax}, $\sin ax$, $\cos ax$ and x^m.

UNIT II

Partial differential equations – Formation of Partial differential equations by elimination of arbitrary constants and arbitrary functions - Definition of general, particular and complete integrals - Solutions of first order equations of the form F(p, q)=0, F(x, p, q)=0, F(y, p, q) = 0, F(z, p, q) = 0, F(x, p)= F(y,q) and z=px+qy+f(p, q).

UNIT III

Laplace Transforms – Definitions and theorems – Some simple problems

UNIT IV

Inverse Laplace transforms - Some simple problems – Solving ordinary differential equations using Laplace Transforms.

UNIT V

Correlation Analysis – Correlation – Karl Pearson's Coefficient of Correlation – Regression – Lines of regression –Angle between two lines of Regression – Regression Coefficients.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. S. Narayanan, T.K. Manicavachagom Pillay, "Calculus, Vol. III", S.Viswanathan Pvt. Ltd., 2013.

   UNIT I : Chapter 2 - § 1, 2, 3, 4a, 4b, 4c.

   UNIT II : Chapter 4 - § 2.1, 2.2, 3, 5.1 - 5.4

   UNIT III : Chapter 5 - § 1, 2, 4

   UNIT IV : Chapter 5 - § 6, 7, 8.

2. A. Singaravelu, "Probability and Statistics for B.Sc. Computer Science – Allied Paper-III, Bharathidasan University", A.R.Publications, 2002. .

   UNIT V : Chapter 4 - All sections excluding Rank Correlation, Repeated ranks and Correction factors.

Reference Book(s):

1. P.R. Vittal, "Allied Mathematics", Third Edition, Margham Publications, 2012.
2. S.C. Gupta, V.K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Website and e-Learning Source(s):

1. https://nptel.ac.in.
2. https://mathpages.com.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	2	1	2	2	3	2	2	3	2	1
CO2	2	1	2	1	3	2	1	2	3	1
CO3	2	2	2	1	3	2	2	3	2	1
CO4	1	2	2	2	3	2	2	2	2	2
CO5	2	1	2	3	3	2	1	2	2	1

(For the candidates admitted from academic year 2023 - 24 onwards)

FIRST ALLIED I: MATHEMATICS I

(For B.Sc. Computer Science Major)

Semester : I **Course Code :**

Hours : 4 (3L + 1T) **Credits : 4**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To introduce the field of operations research which has many applications in management techniques.
2. To help students to find optimum solution in business and management problems.
3. To study the methods used to solve assignment problems and transportation problems.
4. To train the students in network problems

Course Outcomes:

CO1: Recognize and relate LPP and solving LPP using graphical method.

CO2: Compute Simplex Algorithm, Two Phase Method and Big-M Method of LPP.

CO3: Explain Transportation problem and evaluate its initial basic feasible solution.

CO4: Discuss and solve assignment problem using Hungarian algorithm.

CO5: Describe and Construct Network and compute PERT and CPM.

UNIT I

Linear Programming Problem: Mathematical Formulation - Product allocation problem - Product mix problem-Production problem only- Graphical Solution Method – Some Exceptional Cases-General Linear Programming Problem.

UNIT II

Transportation Problem: Definition – Formulation of Transportation problem -Finding an Initial Basic Feasible Solution – North-West Corner Rule – Matrix Minima Method – Vogel's Approximation Method – Unbalanced Transportation Problems.

UNIT III

Assignment Problem: Definition – Mathematical Formulation of the problem - Hungarian Method – Unbalanced Problems.

UNIT IV

Network Scheduling (CPM): Introduction - Network – Rules of Network construction- Concurrent activities – Critical path analysis.

UNIT V

Network Scheduling (PERT): PERT Calculations - Finding t_0, t_m, t_p, t_e, σ and critical path only(excluding Probability) – Distinction between PERT and CPM.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. Kantiswarup, P.K.Gupta and Manmohan, "Operations Research", Sixteenth Edition, Sultan Chand and Sons Educational Publishers, New Delhi, 2014.

   UNIT I : Chapter 2 - § 2.3 - 2.4 and Chapter 3 - § 3.2 - 3.4.

   UNIT II : Chapter 10 - § 10.1 -10.2(General form only),10.3, 10.9.

   UNIT III : Chapter 11 - § 11.1 - 11.2 (General form only), 11.3

   UNIT IV : Chapter 25 - § 25.1 - 25.2 & 25.4 - 25.6.

   UNIT V : Chapter 25 - § 25.7 - 25.8.

Reference Book(s):

1. Er. Premkumar Gupta, Dr.D.S. Hira, "Problems in Operations Research (Principles and Solutions)", Nineth Edition, S. Chand Company Limited, New Delhi, 2013.
2. Sundaresan. V., Ganapathy Subramanian K.S., Ganesh. K., "Resource Management Techniques", A.R publications, 2022.

Website and e-Learning Source(s):

1. https://nptel.ac.in.
2. https://mathpages.com.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	2	1	2	2	3	2	2	3	2	1
CO2	2	1	2	1	3	2	1	2	3	1
CO3	2	2	2	1	3	2	2	3	2	1
CO4	1	2	2	2	3	2	2	2	2	2
CO5	2	1	2	3	3	2	1	2	2	1

(For the candidates admitted from academic year 2023 - 24 onwards)

FIRST ALLIED II: MATHEMATICS II

(For B.Sc. Computer Science Major)

Semester : II **Course Code :**

Hours : 4 (3L + 1T) **Credits : 2**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To introduce different numerical techniques to solve Algebraic and Transcendental differential equations.
2. To expose differential equations as a powerful tool in solving problems.
3. Introduction of Laplace transforms techniques to solve ODE's
4. To apply the basic concepts of statistics.
5. To understand the various statistical methods by giving real life examples

Course Outcomes: The students will be able to

CO1: Understand the relationship between the transcendental and the algebraic equations.

CO2: Apply the technique from the ordinary differential equation using Laplace transformation technique.

CO3: Understand Laplace transforms and discuss the properties of Laplace transforms.

CO4: Define and illustrate the inverse transforms.

CO5: Recognize the correlation coefficient through regression.

UNIT I

The solution of algebraic and transcendental equations: Iterative Method – Bisection Method - Method of False Position.

UNIT II

Second order linear differential equations with constant coefficients – particular integrals for e^{ax}, sin ax, cos ax and x^m. (Problems only)

UNIT III

Laplace transforms: Laplace transforms for e^{at}, sinat, cosat, t^n, Laplace transforms of f '(t) and f "(t) .

UNIT IV

Inverse Laplace Transforms: Inverse Laplace transforms related to the standard forms – Application of Laplace transforms for solving ordinary differential equations with constant coefficients.

UNIT V

Correlation Analysis: Correlation – Karl Pearson's Coefficient of Correlation – Regression – Lines of regression – Angle between two lines of Regression – Regression Coefficients.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Books:

1. S.Arumugam, A.Thangapandi Isaac, A.Somasundaram, "Numerical Methods", Second Edition, Scitech Publications(India) Pvt. Ltd., Chennai, 2010.

   UNIT I : Chapter 1 – § 3.2 - 3.4.

2. S. Narayanan, T.K. Manicavachagom Pillay, "Calculus, Vol. III", S.Viswanathan Pvt. Ltd., 2013.

   UNIT II : Chapter 2 - § 1, 2, 3, 4(a, b & c only).

   UNIT III : Chapter 5 - § 1, 2, 4.

   UNIT IV : Chapter 5 - § 6, 7, 8.

3. A. Singaravelu, "Probability and Statistics for B.Sc. Computer Science – Allied Paper-III, Bharathidasan University", A.R.Publications, 2002.

   UNIT V: Chapter 4 - All sections excluding Rank Correlation, Repeated ranks and Correction factors.

Reference Book(s):

1. P.R. Vittal, "Allied Mathematics", Third Edition, Margham Publications, 2012.
2. S.C. Gupta, V.K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.

Website and e-Learning Source(s):

1. https://nptel.ac.in.
2. https://mathpages.com.
3. https://swayam.gov.in/nc_details/NPTEL.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	2	1	2	2	3	2	2	3	2	1
CO2	2	1	2	1	3	2	1	2	3	1
CO3	2	2	2	1	3	2	2	3	2	1
CO4	1	2	2	2	3	2	2	2	2	2
CO5	2	1	2	3	3	2	1	2	2	1

For the candidates admitted from academic year 2023 - 24 onwards)

FIRST ALLIED III: MATHEMATICS III

(For B.Sc. Computer Science Major)

Semester : II **Course Code :**

Hours : 4 (3L + 1T) **Credits : 4**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To study the techniques to find the sum of different series.
2. To study the characteristic roots and vectors of the matrix.
3. To know the concept of theory of equations.
4. To study and apply the Cayley-Hamilton theorem.
5. To find the rank of a matrix using various methods.

Course Outcomes: The students will be able

CO1: To apply the Binomial and Exponential theorems to find the sum of series.

CO2: Apply Domain knowledge for relation between the coefficients and the roots of an algebraic equation with an examples.

CO3: To know the transformation of equations and the reciprocal equations.

CO4: To learn methods to find the rank of a matrix and to solve the system of equations.

CO5: Determine the concepts of Eigen values and Eigen vectors.

UNIT I

Binomial theorem: Statement of Binomial theorem - Application of the Binomial theorem to the summation of series - Exponential series - Statement of the Exponential theorem - Summation. (Simple problems only).

UNIT II

Transformations of equations: Roots with signs changed-Roots multiplied by a given number – To increase or decrease the roots of a given equation by a given quantity. (Simple problems only)

UNIT III

Transformations of equations (Ctd.): Reciprocal equations – Descarte's Rule of signs.

UNIT IV

Matrices: Orthogonal matrices – Properties of orthogonal matrices - Characteristics equation – Eigen values and Eigen vectors only - Statement of Cayley-

Hamilton Theorem (proof excluded) – Application of Cayley Hamilton theorem. (simple problems only).

UNIT V

Matrices (Ctd.): Solution of simultaneous equations - Rank of a matrix – Finding the ranks of 2x2, 3x3 matrices using Determinants and Elementary transformation– System of non-homogeneous linear equations. (simple problems only).

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. T.K.Manicavachagom Pillay, T.Natarajan and K.S.Ganapathy, "Algebra - Volume I", S.Viswanathan Pvt. Ltd., 2016.

   UNIT I : Chapter 3 - § 1, 10 and Chapter 4 - § 2 , 3

   UNIT II : Chapter 6 - § 15.1,15.2, 17.

   UNIT III : Chapter 6 - § 16 , 24

2. T.K.Manicavachagom Pillay, T.Natarajan and S.Ganapathy, "Algebra-Volume II", S.Viswanathan Pvt. Ltd., 2016.

   UNIT IV : Chapter 2 - § 9.1 - 9.2, 16, 16.3 - 6.5.

   UNIT V : Chapter 2- § 10 -13, 13.1, 16

Reference Book(s):

1. S.G. Venkatachalapathy, "Allied Mathematics", Margham Publication, 2011.
2. Dr.A.Singaravelu, "Allied Mathematics", ARS publications, 2018.

Website and e-Learning Source(s):

1. https://nptel.ac.in.
2. https://mathpages.com.
3. https://swayam.gov.in/nc_details/NPTEL.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	2	1	2	2	3	2	2	3	2	2
CO2	2	1	2	1	3	2	1	2	3	1
CO3	2	2	2	1	3	2	2	3	2	1
CO4	1	2	2	2	3	2	2	2	2	2
CO5	2	1	2	3	3	2	1	2	2	1

(For the candidates admitted from academic year 2023 - 24 onwards)

FIRST ALLIED I: MATHEMATICS I

(For Statistics Major)

Semester : I **Course Code :**

Hours : 4 (3L + 1T) **Credits : 4**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To acquire the basic skills of differentiation, successive differentiation, and their applications.
2. To apply Leibnitz theorem.
3. To introduce several techniques of integration of real valued functions.
4. To acquire knowledge on properties of integration.
5. To learn Beta and Gamma functions and their properties.

Course Outcomes: The students will be able to

CO1: Find the nth derivative of a given function.

CO2: To form equations involving derivatives and apply Leibnitz formula

CO3: Determine the integrals of algebraic, trigonometric and logarithmic functions.

CO4: Evaluate the integrals using properties of integration

CO5: Explain beta and gamma functions and to use them in solving problems of integration.

UNIT I

Successive Differentiation - n^{th} derivative - standard results.

UNIT II

Formations of equations involving derivatives-Leibnitz theorem (no proof) for the n^{th} derivative of a product.

UNIT III

Integration: Formulae for integrals – Definite integrals – Integration by parts.

UNIT IV

Properties of Definite integrals.

UNIT V

Beta and Gamma functions – Definitions – Recurrence formula of Gamma function–Properties of Beta function-Relation between Beta and Gamma function and Simple problems.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. S. Narayanan and T.K. Manicavachagomillay, "Calculus Volume – I", S.Viswanathan Pvt. Ltd., 2015.

   UNIT I : Chapter 3 - § 1.1 - 1.4.

   UNIT II : Chapter 3 - § 1.6 & 2.1.

2. S. Narayanan and T.K. Manicavachagom illay, "Calculus Volume – II", S.Viswanathan Pvt. Ltd., 2013.

   UNIT III : Chapter 1 - § 2 – 4 & 12.

   UNIT IV : Chapter 1 - §11 only.

   UNIT V : Chapter 7 - § 2.1, 2.3, 3 & 4.

Reference Book(s):

1. S.G. Venkatachalapathy, "Allied Mathematics", Margham Publication, 2011.
2. Dr.A.Singaravelu, "Allied Mathematics", ARS publications, 2018.

Website and e-Learning Source(s):

1. https://nptel.ac.in.
2. https://mathpages.com.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	2	1	2	2	3	2	2	3	2	1
CO2	2	1	2	1	3	2	1	2	3	1
CO3	2	2	2	1	3	2	2	3	2	1
CO4	1	2	2	2	3	2	2	2	2	2
CO5	2	1	2	3	3	2	1	2	2	1

(For the candidates admitted from the academic year 2023 - 24 onwards)

FIRST ALLIED II: MATHEMATICS II

(For Statistics Major)

Semester : II **Course Code :**

Hours : 4 (3L + 1T) **Credits : 2**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To acquire knowledge about the methods of solving Ordinary Differential Equations.
2. To expose differential equations as a powerful tool in solving problems.
3. To learn about Laplace and inverse Laplace transforms.
4. To introduce different numerical techniques to solve algebraic equations.
5. To understand how Differential Equations can be used as a powerful tool in solving problems in science.

Course Outcomes: The students will be able to

CO1: Find the complimentary functions of equations of second order differential equations with constant coefficient and to determine particular integrals of algebraic, exponential, and trigonometric functions.

CO2: Form a PDE by eliminating arbitrary constants and arbitrary functions.

CO3: Solve partial differential equations using various methods.

CO4: Find solutions of linear differential equations using Laplace and inverse Laplace transform.

CO5: Find the solution of algebraic and transcendental equations using numerical methods.

UNIT I

Differential Equations: Second order differential equations with constant coefficients – Particular integrals for e^{ax}, sinax, cosax, x^m.

UNIT II

Partial Differential Equations: Formation of equations by eliminating arbitrary constants and arbitrary functions - Solving partial differential equations (first order only).

UNIT III

Laplace Transforms: Definitions – Sufficient conditions – Properties – Initial and final value theorems – Laplace transforms of exponential, trigonometric, hyperbolic and polynomial functions - Problems.

UNIT IV

The Inverse Laplace Transforms: Formulae – (i) to (vii) methods to find the inverse Laplace transforms – Problems – Solving ordinary differential equation with constant coefficients using Laplace transformation.

UNIT V

Algebraic and Transcendental Equations: Introduction – Errors in numerical computation - Iteration method – Bisection method – Newton-Raphson method.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text book(s):

1. S. Narayanan, T.K. Manicavachagom Pillay, "Calculus, Vol. III", S.Viswanathan Pvt. Ltd., 2013.

   UNIT I : Chapter 2 - § 1 – 4.

   UNIT II : Chapter 4 - § 1 - 3 & 5.1 - 5.4.

   UNIT III : Chapter 5 - § 1 - 2 & 4 – 5.

   UNIT IV : Chapter 5 - § 6 – 8.

2. S.Arumugam, A.Thangapandi Isaac, A.Somasundaram, "Numerical Methods", Second Edition, Scitech Publications(India) Pvt. Ltd., Chennai, 2010.

   UNIT V : Chapter 3 - § 3.0 - 3.3 & 3.5.

Reference Book(s):

1. P.R. Vittal, "Allied Mathematics", Third Edition, Margham Publications, 2012.
2. M.K. Jain, S.R.K. Iyengar, R.K. Jain, "Numerical methods for Scientific and Engineering computation", New Age International (P) Limited, Reprint 2003.

Website and e-Learning Source(s):

1. https://nptel.ac.in.
2. https://mathpages.com.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	2	1	2	2	3	2	2	3	2	1
CO2	2	2	2	2	3	2	1	2	3	1
CO3	2	2	2	2	3	2	2	3	2	1
CO4	1	2	2	2	3	2	2	2	2	1
CO5	2	1	2	3	3	2	1	2	2	1

(For the Candidates admitted from the academic year 2023-2024 onwards)

First Allied III : Mathematics III

(For Statistics Major)

Semester: II **Course Code :**

Hours.: 4 (3L+1T) **Credits : 4**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To learn the characteristic roots of the matrix and Cayley Hamilton theorem.
2. To solve System of non-homogeneous linear equations using Elementary transformation
3. To form an equation with given roots
4. To introduce several techniques for transforming equations.
5. To understand and solve reciprocal equations.

Course Outcomes: Students will be able to

CO1 : Find the eigen values & eigen vectors and to apply Cayley – Hamilton Theorem.

CO2 : Solve System of non-homogeneous linear equations using Elementary transformation

CO3 : Form an equation with given roots

CO4 : Acquire the detailed knowledge about transformation of equations.

CO5 : Solve reciprocal equations.

UNIT I

Orthogonal matrices – Properties of orthogonal matrices - Characteristics equation – Eigen values and Eigen vectors only - Statement of Cayley- Hamilton Theorem – Application of Cayley-Hamilton theorem.

UNIT II

Solution of simultaneous equations - Rank of a matrix– Finding the ranks of 2x2, 3x3 matrices using Determinants and Elementary transformation – System of non-homogeneous linear equations.

UNIT III

Form an equation with given roots – imaginary roots occur in pairs – irrational roots occurs in pairs – Relation between roots and coefficients. (Problems only).

UNIT IV

Transformations of equations - Roots with sign changed – Roots multiplied by a number – increase or decrease the roots – Form of the quotient and remainder when a polynomial is divided by a binomial. (Problems only).

UNIT V

Reciprocal equations – Descarte's rule of signs – Rolle's Theorem.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text book(s):

1. T.K.Manicavachagom Pillay, T. Natarajan, K.S.Ganapathy, "Algebra - Volume II", S.Viswanathan Pvt. Ltd., 2016.

   UNIT I : Chapter 2 - § 9.1 - 9.2, 16, 16.3 - 16.5.

   UNIT II : Chapter 2 - § 10 -13, 13.1, 16.

2. T.K.Manicavachagom Pillay, T. Natarajan, K.S.Ganapathy, "Algebra - Volume I", S.Viswanathan Pvt. Ltd., 2016.

   UNIT III : Chapter 6 - § 9 – 11.

   UNIT IV : Chapter 6 - § 15.1 - 15.2 & 17 – 18.

   UNIT V : Chapter 6- § 16.1 - 16.2 & 24 – 25.

Reference Book(s):

1. P.R. Vittal, "Allied Mathematics", Third Edition, Margham Publications, 2012.
2. S.G. Venkatachalapathy, "Allied Mathematics", Margham Publication, 2011.
3. Dr.A. Singaravelu, "Allied Mathematics", ARS Publications, 2018.

Website and e-Learning Source(s):

1. https://nptel.ac.in

For Mapping with POs and PSOs:

	POs					PSOs				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	2	3	2	1	3	3	2	2	1
CO2	3	2	3	2	1	3	3	2	3	1
CO3	3	2	3	2	1	3	3	2	2	1
CO4	3	2	3	2	1	3	3	2	3	2
CO5	3	2	3	2	1	3	3	2	3	1

(For the candidates admitted from the academic year 2023 - 2024 onwards)

FIRST ALLIED I: MATHEMATICS I

(For BCA)

Semester: I **Subject Code:**

Hours : 4 **Credits : 4**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To train the students to solve the problems in Theory of Equations.
2. To gain the Knowledge of various types of matrices and eigen values
3. To train the students to find the optimal values and points of inflexion of functions.
4. To learn the basic concepts in integration.
5. To gain the knowledge of solving second order differential equations.

Course Outcomes:

On completion of the course, the student will be able to

CO1: Apply domain knowledge for Relation between the coefficients and the roots of an algebraic equation.

CO2: Determine the concepts of Eigen values and Eigen vectors.

CO3: To find maxima and minima, critical points and inflection points of functions.

CO4: Evaluate different types of integrals.

CO5: Discuss and solve Linear Equations with constant coefficients.

UNIT I

Theory of Equations: Relation between roots & coefficients – Transformations of Equations – Diminishing, Increasing & Multiplying the roots by a constant- Rolle's Theorem, Descarte's rule of Signs (statement only) – Simple problems.

UNIT II

Matrices: Singular matrices – Inverse of a non-singular matrix using adjoint method - Rank of a Matrix – Consistency – Characteristic equation, Eigen values, Eigen vectors – Cayley Hamilton's Theorem (proof not needed) – Simple applications only

UNIT III

Differentiation: Maxima & Minima – Concavity, Convexity – Points of inflexion - Partial differentiation – Euler's Theorem - Total differential coefficients (proof not needed) –Simple problems only.

UNIT IV

Integration: Evaluation of integrals of types 1. $\int \frac{px+q}{ax^2+bx+c}dx$ 2. $\int \frac{px+q}{\sqrt{ax^2+bx+c}}dx$ 3. $\int \frac{dx}{a+b\sin x}$ 4. $\int \frac{dx}{a+b\cos x}$ – Evaluation using Integration by parts.

UNIT V

Differential Equations: Variables Separables – Linear equations – Second order of types $(a D^2 + bD + c) y = F(x)$ where a,b,c are constants and F (x) is one of the following types (i) e^{Kx} (ii) sin(kx) or cos (kx) (iii) x^n, n being an integer.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. T.K. Manickavasagam Pillai& Others, Algebra, Vol I, S.V Publications, 2004 (Unit I)
2. T.K. Manickavasagam Pillai& Others, Algebra, Vol II, S.V Publications, Pvt. Ltd 2011. (Unit II)
3. S. Narayanan, T.K. Manicavachagam Pillai, Calculus, Vol. I, S. Viswanathan Pvt Limited, 2010. (Units III)
4. S. Narayanan, T.K. Manicavachagam Pillai, Calculus, Vol. II, S. Viswanathan Pvt Limited, 2011. (Units IV)
5. S. Narayanan, T.K. Manicavachagam Pillai, Calculus, Vol. III, S. Viswanathan Pvt Limited, 2008 (Units V)

UNIT – I :	Chapter – 6 -	§ 11, 15, 17, 18, 24, 25 of [1]
UNIT – II :	Chapter – 2 -	§ 1 to 16 of [2]
UNIT – III :	Chapters – 5 & 8-	§ 1, 2 &1.1 to 1.6 of [3]
UNIT – IV :	Chapter – 1 -	§ 7,8,9,11 of [4]
UNIT – V :	Chapter – 1 & 2-	§ 2.1, 2.4 & 1 to 3 of [5]

Reference Book(s):

1. M.L. Khanna, Differential Calculus, Jaiprakashnath and Co., Meerut-2004.
2. S. Rethina Kumar, "Algebra and Calculus", Sai Publication – 2015.

Website and e-Learning Source(s):

1. https://nptel.ac.in

For Mapping with POs and PSOs:

	POs					PSOs				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	1	2	3	2	3	1	2	3	2	1
CO2	2	1	3	1	3	3	2	2	3	2
CO3	3	2	2	1	3	3	2	3	2	1
CO4	1	3	2	2	3	3	2	2	3	2
CO5	3	1	2	2	3	3	2	2	3	1

(For the candidates admitted from the academic year 2023 - 2024 onwards)

FIRST ALLIED II: MATHEMATICS II

(For BCA)

Semester: I **Course Code :**

Hours: 4 (3L + 1T) **Credits : 4**

Pre-requisite : 12th Standard Mathematics

Course Objectives:

1. To solve algebraic and transcendental equations using numerical methods.
2. To apply numerical methods to solve real life problems.
3. To acquire the knowledge of problem solving ability.
4. To train the students in the numerical problems.
5. Find the solution of linear system of equations.

Course Outcomes:

On completion of the course, the student will be able to

CO1: Compute the Solution of Algebraic and Transcendental equation using Bisection, Method of false position and Newton- Raphson Method.

CO2: Find the solution of linear system of equation by Gaussian Elimination, Gauss Jacobi, and Gauss Seidel Methods.

CO3: Solve Interpolation of Finite differences – Newton's Forward, Central and Backward differences.

CO4: Obtain the Numerical differentiation and integration.

CO5: Derive and compute the solution of Taylor series, Picard's and Euler method and Runge–Kutta Methods.

UNIT I

Algebraic & Transcendental Equations: Finding a root of the given equation (Derivation of the formula not needed) using Bisection Method, Iteration Method, Method of False Position, Newton Raphson Method,.

UNIT II

Solutions to Linear Systems: Introduction **-** Gaussian Elimination Method - Gauss-Jordan Elimination Method - Iterative methods-Gauss-Jacobi Method – Gauss-Seidel Method of Iteration.

UNIT III

Finite Differences: First Difference- Forward and Backward differences – Newton's Forward & Backward difference interpolation formula – Divided differences and their properties – Lagrange's Interpolation Formula. (Proof not needed).

UNIT IV

Numerical Differentiation and Integration: Introduction – Newton's Forward and Backward Differences to compute derivatives - Numerical Integration using Trapezoidal rule & Simpson's one-third and three-eight rule.

UNIT V

Numerical Solution of ODE: Solution by Taylor Series Method – Euler Method – Runge-Kutta 2nd and 4th order Methods.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. Dr.P.Kandasamy, Dr.K.Thilagavty, Dr.K.Gunavathi, Numerical Methods, S.Chand & co., 2010.

UNIT – I : Chapter – 3 - § 3.1 to 3.4

UNIT – II : Chapter – 4 - § 4.1, 4.2, 4.2.1, 4.7 to 4.9.

UNIT – III : Chapter – 5 - § 5.1, 5.2.

Chapter – 6 & 8 - § 6.2, 6.3 & 8.2, 8.3, 8.7

UNIT –IV : Chapter – 9 - § 9.1 to 9.3, 9.9, 9.13, 9.14.

UNIT – V : Chapter – 11 - §11.5, 11.8 to 11.13,11.16 to 11.18.

Reference Book(s):

1. S. Narayanan & Others, Numerical Analysis, S. Viswanathan Publishers, 1994.
2. A.Singaravelu, Numerical Methods, Meenachi Agency, June 2000.
3. S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India Pvt.Limited, 4th Edition, 2009.

Website and e-Learning Source(s):

1. https://nptel.ac.in.

For Mapping with POs and PSOs:

	POs					PSOs				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	1	2	3	2	3	1	2	3	2	1
CO2	2	1	3	1	3	3	2	3	2	1
CO3	2	2	3	1	2	3	2	3	2	1
CO4	1	2	2	2	3	3	1	2	3	2
CO5	3	1	2	3	3	2	2	3	3	1

(For the candidates admitted from the academic year 2023 - 2024 onwards)

FIRST ALLIED III: MATHEMATICS III

(For BCA)

Semester: II **Course Code :**

Hours : 4 (3L + 1T) **Credits : 4**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To introduce the field of operations research which has many applications in management techniques.
2. To help students to find optimum solution in business and management problems.
3. To gain the knowledge of Transportation problems.
4. To gain the knowledge of Assignment problems.
5. To gain the knowledge of Network problems and critical path.

Course Outcomes:

On completion of the course, the student will be able to

CO1: Formulate a real-life problem as a Linear Programming problem and to solve LPP by graphical method.

CO2: Solve balanced and unbalanced Transportation problems.

CO3: Solve balanced and unbalanced Assignment problems.

CO4: Find Critical path of a given network.

CO5: Do PERT calculations.

UNIT I

Linear Programming Problem – Mathematical Formulation –Product allocation problem-Product mix problem-Production problem only- Graphical Solution Method– Some Exceptional Cases-General Linear Programming Problem.

UNIT II

Transportation Problem – Definition – Formulation of Transportation problem -Finding an Initial Basic Feasible Solution – North-West Corner Rule – Matrix Minima Method – Vogel's Approximation Method – Unbalanced Transportation Problems.

UNIT III

Assignment Problem – Definition – Mathematical Formulation of the problem- Hungarian Method – Unbalanced Problems.

UNIT IV

Network Scheduling (**CPM)** – Introduction-Network –Rules of Network construction- Concurrent activities –Critical path analysis.

UNIT V

Network Scheduling (PERT) – PERT Calculations – t_0, t_m, t_p, t_e, σ only – Distinction between PERT and CPM.

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. Kantiswarup, P.K.Gupta and Manmohan, "Operations Research", 16th Edition, Sultan Chand and Sons, Educational Publishers, New Delhi, 2014.

UNIT I : Chapter 2 - § 2.3 to 2.4 and Chapter 3- § 3.2 to 3.4

UNIT II : Chapter 10 - § 10.1, 10.2(General form only),10.3, 10.9

UNIT III : Chapter 11 - § 11.1, 11.2 (General form only),11.3

UNIT IV : Chapter 25 - § 25.1, 25.2, 25.4 to 25.6

UNIT V : Chapter 25 - § 25.7,25.8.

Reference Book(s):

1. Prem Kumar, Gupta and D.S. Hira, "Operations Research", An Introduction, S. Chand and Co., Ltd. New Delhi,
2. Hamdy.A.Taha, "Operations Research", Seventh Edition, McMillan Publishing Company, New Delhi, 1982.

Website and e-Learning Source(s):

https://nptel.ac.in

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	1	3	2	2	3	2	1	3	2	1
CO2	2	1	3	1	3	3	2	2	3	2
CO3	3	2	2	1	3	3	2	3	2	1
CO4	1	3	2	2	3	3	2	2	3	2
CO5	3	2	3	1	3	3	2	2	3	1

(For the candidates admitted from the academic year 2023-2024 onwards)

Non-Major Elective – I: OPTIMIZATION TECHNIQUES I

(II B.Com. Sec. A & B)

Semester : IV **Course Code :**
Hours : 2 **Credits : 2**

Pre-requisite: 12th Standard Mathematics

Course Objectives:

1. To provide fundamental knowledge of Liner programming problem.
2. To introduce the various techniques of solving Transportation problem.
3. To solve real world problems on assignment problems.
4. To make the students to solve the real-life problems in sequencing problems.
5. To solve real world problems on replacement models.

Course Outcomes: Students will be able to

CO1: Solving LPP using graphical solution method.
CO2: Finding an IBFS using NWCR, LCM and VAM method.
CO3: Solving assignment problems using Hungarian method.
CO4: Solving processing n jobs through two machines using Johnson's algorithm.
CO5: Identifying when should the machine be replacing the year promptly.

UNIT I

Linear Programming Problem: Graphical Method of solution for a given linear programming problem. (Simple problems only)

UNIT II

The Transportation Model: Finding an Initial Basic Feasible Solution using North-west Corner Rule, Matrix Minima Method (Least Cost Method) and Vogel's Approximation Method. (Simple problems only)

UNIT III

The Assignment Model: Solution of a given assignment problem - Balanced assignment problems only. (Simple problems only)

UNIT IV

Sequencing Models: n jobs processing through two machines only. (Simple problems only)

UNIT V

Replacement Models: Replacement of items whose maintenance and repair costs increase with Time, Ignoring Changes in the Value of Money during the Period. (Simple problems only)

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s) :

1. Er. Prem Kumar Gupta & Dr. D. S. Hira, "Problems in Operations Research (Principles and Solutions)", S. Chand & Company Pvt. Limited, New Delhi, 2013

   UNIT I : Chapter 2 - § 2.3

   UNIT II : Chapter 3 - § 3.2 to 3.4

   UNIT III : Chapter 4 - § 4.1 to 4.5

   UNIT IV : Chapter 5 - § 5.1,5.2, 5.4

   UNIT V : Chapter 11 - § 11.2 , excluding 11.2.1

Reference Book(s):

1. Taha. H.A, Operation Research: An Introduction, McMilan Publishing Co., 1982. 7th ed.
2. Kanti Swarup, Gupta. P.K. & Man Mohan, operations Research, S.Chand & Sons.

Website and e – Learning Source(s):

1. https://nptel.ac.in.

For Mapping with POs and PSOs:

	POs					PSOs				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	3	2	3	1	3	3	2	1	1	3
CO2	3	2	3	1	3	3	2	1	2	3
CO3	3	3	3	3	3	3	3	1	2	3
CO4	3	3	3	3	3	3	3	1	2	3
CO5	3	3	3	3	3	3	3	1	2	3

(For the candidates admitted from the academic year 2023 - 2024 onwards)

Non-Major Elective II: OPTIMIZATION TECHNIQUES II

(III B.Com. Sec. A & B)

Semester : VI **Course Code :**

Hours : 2 **Credits : 2**

Prerequisite: 12th Standard Mathematics

Course Objectives:

1. To introduce the various techniques of research.
2. To increase the skill in solving sequencing problems and theory of games.
3. To gain knowledge and apply inventory problems.
4. To find Critical path methods and apply PERT calculations.
5. To make students solve real life problems in business and management.

Course Outcomes: The students will be able to

CO1: Solve sequencing problem

CO2: Apply the games techniques to solve real life problems.

CO3: Gain knowledge in solving inventory problems.

CO4: Find critical path method in network

CO5: Understand the PERT calculations.

UNIT I

Sequencing Problems: Processing n jobs through three machines only. (Simple Problems only)

UNIT II

Theory of Games: Characteristics of games - Definitions - Rule1 Look for a Pure strategy - Rule 2 Reduce Game by Dominance - Rule 3 Solve for a Mixed strategy - Mixed Strategies (2 x 2 Games) – Graphical method for (2xn or mx2 games) only. (Simple Problems only)

UNIT III

Inventory Problem: Inventory Models with Deterministic Demand – Classical EOQ model (with no shortage). (Simple Problems only)

UNIT IV

Project scheduling by CPM: Network – Critical Path Method. (Simple Problems only)

UNIT V

Project scheduling by PERT: PERT calculations to, tm, tp, te, σ - finding critical path only. (Simple Problems only)

Extended Professional Component:

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

Text Book(s):

1. Er. Prem Kumar Gupta & Dr.D. S. Hira, "Problems in Operations Research (Principles and Solutions)", S. Chand & Company Pvt. Limited, New Delhi, 2013.

   UNIT I : Chapter 5 - § 5.5.

   UNIT II : Chapter 8 - § 8.4-1 - 8.4-4, 8.4-6.1 & 8.4-7.3.

   UNIT III : Chapter 12 - § 12.1 - 12.3 & 12.5-1.

   UNIT IV : Chapter 14 - § 14.1 - 14.8.

   UNIT V : Chapter 14 - § 14.9.

Reference Book(s):

1. Kanti Swarup, P.K. Gupta and Manmohan, "Operations Research", Sixteenth Edition, Sultan Chand and Sons Educational publishers, New Delhi, 2014.
2. Sundaresan.V, Ganapathy Subramanian K.S, Ganesh. K., "Resource Management Techniques", A.R Publications, 2022.

Website and e-Learning Source(s):

1. https://onlinelibrary.wiley.com.
2. https://nptel.com.

For Mapping with POs and PSOs:

	POs					**PSOs**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	2	2	3	2	3	3	2	3	2	1
CO2	1	1	3	1	3	3	2	2	3	1
CO3	3	2	3	1	3	3	2	3	2	1
CO4	1	2	3	2	3	3	2	2	3	2
CO5	3	1	2	3	3	3	2	2	3	1