DHANALAKSHMISRINIVASANCOLLEGEOFARTS &SCIENCE FORWOMEN
(AUTONOMOUS)
ReaccreditedwithA"GradebyNAAC ,(AffiliatedtoBharathidasanUniversity)
Perambalur-621 212
DEPARTMENT OF MATHEMATICS
M.Sc., MATHEMATICS-COURSE STRUCTURE UNDER CBCS-IBCS
(CANDIDATES ADMITTED FROM 2022-2023 ONWORDS**)**

SEMESTER	COURSE	COURSE TITLE	COURSE CODE	INSTRUCTION PERIOD PER WEEK	CREDIT	EXAM HOURS	MARKS		TOTAL
							INT	EXT	
SEM I	CC- I	ABSTRACT ALGEBRA	22PMM1C1	6	5	3	25	75	100
	CC –II	REAL ANALYSIS	22PMM1C2	6	5	3	25	75	100
	CC-III	ORDINARY DIFFERENTIAL EQUATIONS	22PMM1C3	6	5	3	25	75	100
	CC-IV	GRAPH THEORY	22PMM1C4	6	5	3	25	75	100
	CEC-I	DISCRETE MATHEMATICS	22PMM1E1A	6	4	3	25	75	100
		DIFFERENTAL GEOMENTRY	22PMM1E1B						
	VAL	INTRODUCTION TO LATEX	22PMM1V1		2*				100*
TOTAL				30	24(2*)		125	375	500(100*)
SEM II	CC-V	LINEAR ALGEBRA	22PMM2C5	6	5	3	25	75	100
	CC-VI	COMPLEX ANALYSIS	22PMM2C6	6	5	3	25	75	100
	CC-VII	PARTIAL DIFFERENTIAL EQUATIONS	22PMM2C7	6	5	3	25	75	100
	CC-VIII	FLUID DYNAMICS	22PMM2C8	6	4	3	25	75	100
	IBC	MATHEMATICAL MODELLING	22PMM2I1	3	3	3	25	75	100
	NME-I	QUANTITATIVE APTITUDE-I	22PMM2N1A	3	2	3	25	75	100
		NUMERICAL METHODS AND STATISTICS	22PMM2N1B						
TOTAL				30	24		150	450	600
SEM III	CC-IX	TOPOLOGY	22PMM3C9	6	5	3	25	75	100
	CC-X	MEASURE THEORY AND INTEGRATION	22PMM3C10	6	5	3	25	75	100
	CC-XI	CLASSICAL DYNAMICS	22PMM3C11	6	5	3	25	75	100

	CC-XII	**CALCULUS OF VARIATIONS, TRANSFORMS AND INTEGRAL EQUATIONS**	**22PMM3C12**	**6**	**5**	**3**	**25**	**75**	**100**
	NME-II	**QUANTITATIVE APTITUDE-II**	**22PMM3N2A**	**3**	**2**	**3**	**25**	**75**	**100**
		R-PROGRAMMING	**22PMM3N2B**						
	SB	**SOFT SKILLS**	**22P3SB**	**3**	**3**	**3**	**25**	**75**	**100**
	ES	**EMPLOYIBILITY SKILLS**	**22P3ES**		**2***				**100***
TOTAL				**30**	**25(2*)**		**150**	**450**	**600 (100*)**
SEM-IV	**CC-XIII**	**FUNCTIONAL ANALYSIS**	**22PMM4C13**	**6**	**5**	**3**	**25**	**75**	**100**
	CC-XIV	**NUMERICAL METHODS**	**22PMM4C14**	**6**	**5**	**3**	**25**	**75**	**100**
	CEC-II	**FUZZY MATHEMATICS**	**22PMM4E2A**	**6**	**4**	**3**	**25**	**75**	**100**
		PYTHON	**22PMM4E2B**						
	PROJECT	**PROJECT WORK**	**22PMM4PW**	**12**	**3**		**40**	**60**	**100**
TOTAL				**30**	**17**		**115**	**285**	**400**
				120	**90(4*)**		**540**	**1560**	**2100 (200*)**

CORE COURSE - I
ABSTRACT ALGEBRA

Semester: I **Max. Marks: 75**
Course Code: 22PMM1C1 **Credit: 05**
Total Periods: 90 **Exam Hours: 03**

Objectives:

To give foundation in Algebraic Structures like Groups & Rings

UNIT I (18 Periods)

Group Theory - A counting principle - Normal Subgroups and Quotient groups - Homomorphism - Cayley's theorem - Permutation groups - Another counting principle - Sylow's theorems

UNIT II (18 Periods)

Ring Theory: Homeomorphisms - Ideals and quotient rings - More ideals and quotient rings -Euclidean Rings - A particular Euclidean Ring.

UNIT III (18 Periods)

Polynomial rings - Polynomials over the rational field - polynomials over commutative Rings -Inner Product spaces.

UNIT IV (18 Periods)

Fields: Extension fields - Roots of Polynomials - More about roots.

UNIT V (18 Periods)

The elements of Galois Theory - Finite fields

UNIT VI (Advanced topics only for discussion)
Current contours:

Module Theory.

TEXT BOOK(S)

1. I.N. Herstein, Topics in Algebra, Second Edition, Wiley Eastern Limited, 2004
   - UNIT I - Chapter 2 Section 2.5, 2.6, 2.7, 2.9, 2.10, 2.11, 2.12
   - UNIT II - Chapter 3 Section 3.3, 3.4, 3.5, 3.7, 3.8
   - UNIT III - Chapter 3 & 4 Section 3.9, 3.10, 3.11, 4.4
   - UNIT IV - Chapter 5 Section 5.1, 5.3, 5.5
   - UNIT V - Chapter 5 & 7 Section 5.6, 7.1

BOOKS FOR REFERENCE

1. David S. Dummit and Richard M. Foote, Abstract Algebra, Third Edition, Wiley Student Edition,2015.
2. Vijay, K. Khanna, and S.K. Bhambri, A Course in Abstract Algebra, Vikas Publishing House Pvt
   Limited, 2008 (Third Edition)

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Understand the concepts of homomorphism, permutation groups and their properties	K3
CO 2	Relate ring theory and more ideals and quotient rings	K3
CO 3	Learn properties of polynomial ring and determine inner product spaces	K4
CO 4	Realize importance of Galois theory and its more about roots	K3
CO 5	Remembering the concepts of ring , fields and extension fields	K4

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	S	S	M	S	S
CO 2	M	S	S	M	S
CO 3	S	S	M	S	S
CO 4	S	M	S	S	M
CO 5	M	S	S	M	S

S- Strong, M- Medium, L- Low

CORE COURSE - II
REAL ANALYSIS

Semester: I **Max. Marks: 75**
Course Code: 22PMM1C2 **Credit: 05**
Total Periods: 90 **Exam Hours: 03**

Objectives:

To give the students a thorough knowledge of the various aspects of Real line and Metric Spaces which is imperative for any advanced learning in Pure Mathematics.

UNIT I (18 Periods)

Basic Topology: Finite, Countable and Uncountable Sets – Metric spaces – Compact sets – Perfect sets – Connected sets. Numerical Sequences and Series: Sequences – Convergence – Subsequences – Cauchy Sequences – Upper and Lower Limits - Some Special Sequences – Tests of convergence – Power series – Absolute convergence – Addition and multiplication of series – Rearrangements.

UNIT II (18 Periods)

Continuity: Limits of functions – Continuous functions – continuity and Compactness– Continuity and connectedness – Discontinuities – Monotonic functions – Infinite limits and limits at infinity. Differentiation: Derivative of a real function – Mean value Theorems - Intermediate value theorem for derivatives – L'Hospital's Rule – Taylor's Theorem – Differentiation of vector valued functions.

UNIT III (18 Periods)

Riemann – Stieltjes Integral: Definition and Existence – Properties – Integration and Differentiation – Integration of vector valued functions.

UNIT IV (18 Periods)

Sequences and series of functions: Uniform Convergence and Continuity – Uniform Convergence and Differentiation – Equi continuous families of functions – The Stone – Weierstrass Theorem.

UNIT V (18 Periods)

Functions of several variables: Linear Transformations - Differentiation – The Contraction Principle – The Inverse Function Theorem - The Implicit Function Theorem.

UNIT VI (Advanced topics only for discussion)

Current contours:

Calculus on manifolds.

TEXT BOOK(S)

1. Walter Rudin, Principles of Mathematical Analysis, Third Edition, Mc Graw Hill, 1976.

UNIT I -Chapters 2 and 3
UNIT II -Chapters 4 and 5
UNIT III -Chapter 6
UNIT IV -Chapter 7
UNIT V -Chapter 9 Section 9.1 to 9.29

BOOKS FOR REFERENCE

1. Tom P. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
2. Serge Lang, Analysis I & II, Addison-Wesley Publishing Company, Inc. 1969

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Understand basic properties of R, Such as its characterization as a complete and ordered field.	K4
CO 2	Classify and explain upper and lower limits, test of convergence, power series.	K4
CO 3	Recognize the difference between continuous and discontinuous	K6
CO 4	Determine the integration and differentiation and weierstras theorem and the implicit function theorem	K5
CO 5	Remembering the upper and lower integrals and the Riemann conditions	K3

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	M	S	S	S	S
CO 2	S	M	S	M	S
CO 3	S	S	S	S	M
CO 4	S	S	M	S	S
CO 5	M	S	S	S	M

S- Strong, M- Medium, L- Low

CORE COURSE - III
ORDINARY DIFFERENTIAL EQUATIONS

Semester: I **Max. Marks: 75**
Course Code: 22PMM1C3 **Credit: 05**
Total Periods: 90 **Exam Hours: 03**

Objectives:

To give an in-depth knowledge of differential equations and their applications and study the existence, uniqueness, stability behavior of the solutions of the ODE

UNIT I (18 Periods)

The general solution of the homogeneous equation– the use of one known solution to find another – The method of variation of parameters – Power Series solutions. A review of power series– Series solutions of first order equations – Second order linear equations; Ordinary points.

UNIT II (18 Periods)

Regular Singular Points – Gauss's hyper geometric equation – The Point at infinity - Legendre Polynomials – Bessel functions – Properties of Legendre Polynomials and Bessel functions.

UNIT III (18 Periods)

Linear Systems of First Order Equations – Homogeneous Equations with Constant Coefficients – The Existence and Uniqueness of Solutions of Initial Value Problem for First Order Ordinary Differential Equations – The Method of Solutions of Successive Approximations and Picard's Theorem.

UNIT IV (18 Periods)

Oscillation Theory and Boundary value problems – Qualitative Properties of Solutions– Sturm Comparison Theorems – Eigen values, Eigen functions and the Vibrating String.

UNIT V (18 Periods)

Nonlinear equations - Autonomous Systems; the phase plane and its phenomena –Types of critical points; Stability – critical points and stability for linear systems –Stability by Liapunov's direct method – Simple critical points of nonlinear systems.

UNIT VI (Advanced topics only for discussion)

Current contours:

system of ODE and using canonical forms to solve.

TEXT BOOK(S)

1. G.F. Simmons, Differential Equations with Applications and Historical Notes, TMH, New Delhi, 2003.

UNIT I - Chapter 3: Sections 15, 16, 19 and Chapter 5: Sections 26 to 28

UNIT II - Chapter 5: Sections 28 to 31 and Chapter 6: Sections 32 to 35
UNIT III - Chapter 7: Sections 37, 38 and Chapter 11: Sections 55, 56
UNIT IV - Chapter 4: Sections 22 to 24
UNIT V - Chapter 8: Sections 42 to 44

BOOKS FOR REFERENCE

1. W.T. Reid, Ordinary Differential Equations, John Wiley & Sons, New York, 1971
2. E.A. Coddington and N. Levinson, Theory of Ordinary Differential Equations, McGraw Hill Publishing Company, New York, 1955.

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Approximate gauss's hyper geometric equation	K5
CO 2	Understand properties of Legendre polynomials and Bessel function	K4
CO 3	Cary out the oscillation and boundary value problems	K4
CO 4	Solve the types of critical points stability, stability by liopunov's direct method	K6
CO 5	Understand the concepts of fundamental matrix and successive approximation for finding solution	K5

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	S	S	S	M	M
CO 2	M	S	M	S	S
CO 3	S	S	S	S	S
CO 4	S	M	S	S	S
CO 5	S	M	S	S	S

S- Strong, M- Medium, L- Low

CORE COURSE - IV
GRAPH THEORY

Semester: I **Max. Marks: 75**
Course Code: 22PMM1C4 **Credit: 05**
Total Periods: 90 **Exam Hours: 03**

Objectives:

To give a rigorous study of the basic concepts of Graph Theory and applications of Graph Theory in other disciplines

UNIT I: BASIC RESULTS (18 Periods)

Basic Concepts - Subgraphs - Degrees of Vertices - Paths and Connectedness- Operations on Graphs - Directed Graphs: Basic Concepts - Tournaments.

UNIT II: CONNECTIVITY (18 Periods)

Vertex Cuts and Edge Cuts - Connectivity and Edge - Connectivity, Trees: Definitions, Characterization and Simple Properties - Counting the Number of Spanning Trees - Cayley's Formula.

UNIT III: INDEPENDENT SETS AND MATCHINGS (18 Periods)

Vertex Independent Sets and Vertex Coverings - Edge Independent Sets –Matchings and Factors - Eulerian Graphs - Hamiltonian Graphs.

UNIT IV: GRAPH COLOURINGS (18 Periods)

Vertex Colouring - Critical Graphs - Triangle - Free Graphs - Edge Colourings of Graphs - Chromatic Polynomials

UNIT V: PLANARITY (18 Periods)

Planar and Nonplanar Graphs - Euler Formula and its Consequences - K5 and K3,3 are Nonplanar Graphs - Dual of a Plane Graph - The Four-Colour Theorem and the Heawood Five-Colour Theorem-Kuratowski's Theorem.

UNIT VI (Advanced topics only for discussion)

Current contours:

Graphical theory in a number of heterogeneous areas.

TEXT BOOK(S)

1. R. Balakrishnan, K. Ranganathan, A Textbook of Graph Theory, Springer International Edition, New Delhi, 2008

UNIT I - Chapter 1 & 2 Section 1.1 to 1.4, 1.7, 2.1 and 2.2
UNIT II - Chapter 3 & 4 Section 3.1, 3.2, 4.1, 4.3 to 4.4
UNIT III - Chapter 5 & 6 Section 5.1 to 5.4, 6.1, 6.2
UNIT IV - Chapter 7 Section 7.1 to 7.4, 7.7
UNIT V - Chapter 8 Section 8.1 to 8.6

BOOKS FOR REFERENCE

1. J.A. Bondy, U.S.R. Murty, Graph Theory with Applications, Mac Milan Press Ltd., 1976.
2. Gary Chartrand, Linda Lesniak, Ping Zhang, Graphs and Digraph, CRC press,2010

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Understand the basic concepts of graphs, directed graphs	K4
CO 2	Understand the properties of trees, counting the number of spanning trees	K5
CO 3	Understand eulerian graph and Hamiltonian graphs	K4
CO 4	Apply the knowledge of graphs to solve the real life problem	K3
CO 5	Define vertex coloring and prove theorems on vertex coloring	K6

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	S	M	S	S	S
CO 2	M	S	S	S	S
CO 3	S	S	S	M	S
CO 4	S	M	S	S	M
CO 5	S	S	M	M	S

S- Strong, M- Medium, L- Low

CORE ELECTIVE COURSE - I
DISCRETE MATHEMATICS

Semester: I **Max. Marks: 75**
Course Code: 22PMM1E1A **Credit: 04**
Total Periods: 90 **Exam Hours: 03**

Objectives:

To study the concepts like Boolean Algebra, Coding theory and obtain the knowledge in Grammar and Languages

UNIT I (18 Periods)

Relations and Functions: Binary relations, equivalence relations and partitions, partial order relations, inclusion and exclusion principle, Hasse diagram, Pigeon hole principle. Functions, inverse functions, compositions of functions, recursive functions

UNIT II (18 Periods)

Mathematical Logic: Logic operators, Truth tables, Theory of inference and deduction, mathematical calculus, predicate calculus, predicates and quantifiers.

UNIT III (18 Periods)

Lattices: Lattices as Partially Ordered Sets. Their Properties, Lattices as algebraic Systems, Sub lattices, Direct Product and homomorphism. Some Special Lattices - Complete, Complemented and Distributive Lattices, Isomorphic Lattices.

UNIT IV (18 Periods)

Boolean Algebra: Various Boolean identities, the switching Algebra Example, Sub Algebras, Direct Production and Homomorphism. Boolean Forms and their Equivalence, Midterm Boolean forms, Sum of Products, Canonical Forms. Minimization of Boolean Functions: Design Examples Using Boolean Algebra, Finite-state Machine

UNIT V (18 Periods)

Computability and Languages: Russell's Paradox and Non computability, Ordered Sets, Languages, Phrase structure grammars, Types of Grammars and Languages, Remarks and Reference.

UNIT VI (Advanced topics only for discussion)

Current contours:

Perron- Frobenius theorem and Google's page rank

TEXT BOOK(S)

1. Trembly. J.P & Manohar.P., "Discrete Mathematical Structures with Applications to Computer Science" McGraw- Hill, 2003.
2. Liu, C.L., "Elements of Discrete Mathematics", McGraw-Hill Book co, 1985.
3. K.D Joshi, "Foundations of Discrete Mathematics", Wiley Eastern Limited, 2003.

UNIT I - Chapter 2 of [1], Chapter 4 of [2], Chapter 2 of [3]
UNIT II - Chapter 1 of [1]
UNIT III - Chapter 4 of [1]
UNIT IV - Chapter 4 of [1]
UNIT V - Chapter 2 of [2]

BOOKS FOR REFERENCE

1. Kolman, Busy & Ross, "Discrete Mathematical Structures", PHI, 1996.

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Construct mathematical arguments using logical connectives and quantifiers	K4
CO 2	Validate and correctness of an argument using statement and predicate calculus	K5
CO 3	Understand how lattices and Boolean algebra are used as tools and mathematical models in the study of networks	K3
CO 4	Learn how to work with some of the discrete structures which include sets, relations, function, graphs and recurrence relation	K4
CO 5	Discuss the theory of inference,quantifiers,predicate calculus	K6

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	M	S	M	S	S
CO 2	S	S	S	S	S
CO 3	S	S	S	M	S
CO 4	S	M	S	S	S
CO 5	S	S	M	S	M

S- Strong, M- Medium, L- Low

CORE ELECTIVE COURSE- I
DIFFERENTIAL GEOMETRY

Semester: I **Max. Marks: 75**

Course Code: 22PMM1E1B **Credit: 04**

Total Periods: 90 **Exam Hours: 03**

Objectives:

To introduce the notion of surfaces and their properties and study geodesics and differential geometry of surfaces

UNIT I (18 Periods)

Space Curves: Definition of a space curve - Arc length - tangent - normal and binormal– curvature and torsion - contact between curves and surfaces- tangent surface- involutes and evolutes- Intrinsic equations - Fundamental Existence Theorem for space curves - Helics

UNIT II (18 Periods)

Intrinsic Properties of a Surface: Definition of a surface - curves on a surface - Surface of revolution -

UNIT III (18 Periods)

Helicoids -Metric- Direction coefficients - families of curves- Isometric correspondence- Intrinsic properties

UNIT IV (18 Periods)

Geodesics: Geodesics - Canonical geodesic equations - Normal property of geodesics- Existence Theorems - Geodesic parallels - Geodesics curvature- Gauss- Bonnet Theorem - Gaussian curvature- surface of constant curvature.

UNIT V (18 Periods)

Non-Intrinsic Properties of a Surface: The second fundamental form- Principal curvature - Lines of curvature - Developable –Developable associated with space curves and with curves on surface – Minimal surfaces - Ruled surfaces.

UNIT VI (Advanced topics only for discussion)

Current contours:

The Gauss Bonet theorems.

TEXT BOOK(S)

1. T.J. Willmore, An Introduction to Differential Geometry, Oxford University Press, (17thImpression) New Delhi 2002. (Indian Print).
   - UNIT I - Chapter 1 Sections 1 to 9
   - UNIT II - Chapter 2 Sections 1 to 3
   - UNIT III - Chapter 2 Sections 4 to 9
   - UNIT IV - Chapter 2 Sections 10 to 18
   - UNIT V - Chapter 3 Sections 1 to 8

BOOKS FOR REFERENCE

1. Wihelm Klingenberg: A course in Differential Geometry, Graduate Texts in Mathematics, Springer Verlag, 1978
2. J.A. Thorpe Elementary topics in Differential Geometry, Under - graduate Texts in Mathematics,
   Springer - Verlag 1979

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Understanding the concept of space curves and contact between curves and surfaces	K3
CO 2	Represent the intrinsic properties of a surface	K4
CO 3	Know the geodesics and canonical geodesic equations	K5
CO 4	Plan and deliver the non intrinsic properties of a surface	K6
CO 5	Understand the physical system involved in partial differential equation	K6

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	M	S	S	S	S
CO 2	S	S	S	M	M
CO 3	S	S	S	S	S
CO 4	S	M	S	S	S
CO 5	S	S	M	S	S

S- Strong, M- Medium, L- Low

VALUED ADDED COURSE

INTRODUCTION TO LATEX

Semester: I **Max. Marks: 100***

Course Code: 22PMM1V1 **Credit: 2***

Objectives:

To make the students learn the art of typing mathematics text on their own.

To include professional training required to become a scholar in mathematics.

UNIT I

Basic structure of Latex 2e- Input file structure – Layout- Editors- Forward search- Inverse search- Compling - Conversion to various formats.

UNIT II

Typesetting simple documents- sectioning- Titles- Page layout- listing- enumerating- quote- letter formula.

UNIT III

Using package amsmath typing equations labeling and refreing.

UNIT IV

Figure inclusion- Table inclusion.

UNIT V

Bibliaography- Index typing – Beamer presentation styles.

UNIT VI (Advanced topics only for discussion)

Current contours:

Type a mathematical article using various journal style files.

TEXT BOOK(S)

Leslie Lamport. Latex: A document preparation system, Addison-wesley, Reading, Massachusetts, second edition, 1994.

REFERENCES

1. Tobias Oetiker, Hubert partl, Irene Hyna and Elisabeth Schlegl., The (Not so) short introduction to LATEX2e, samurai media limited (or available online at http.//mirrors.ctan.org/info/Ishort/English/short. pdf).
2. Latex tutorials- A primer, indian Tex users group, available online at http.//www.tug.org/twg/mactex/tutorials/txtprimer-1.0.pdf.
3. Amsmath and geometry package available in Ctan org.

COURSE OUTCOMES:

- Students can type their own mathematical article/ notes/ book/ journal paper/ project work.
- Will motivate them to meticulously prepare their own mathematical notes.
- Able to understand basic structure of Latex 2e and conversions of them to various formats.
- Use various style files and in particular amsmath, amsfont, ansthm.
- Understand how to align math equations, matrices etc.
- Utilize bibtex feature of including bibliographies and indexes.

CORE COURSE - V
LINEAR ALGEBRA

Semester: II **Max. Marks: 75**
Course Code: 22PMM2C5 **Credit: 05**
Total Periods: 90 **Exam Hours: 03**

Objectives:

To give the students a thorough knowledge of the various aspects of Linear Algebra and train the students in problem-solving as a preparatory for Competitive Exams

UNIT I (18 Periods)

Matrices: Systems of linear Equations - Matrices and Elementary Row operations -Row-reduced Echelon Matrices - Matrix Multiplication - Invertible Matrices -Bases and Dimension (Only revision of Vector spaces and subspaces)

UNIT II (18 Periods)

Linear Transformations: The algebra of linear transformations - Isomorphism of Vector Spaces -Representations of Linear Transformations by Matrices - Linear Functional– The Double Dual - The Transpose of a Linear Transformation.

UNIT III (18 Periods)

Algebra Of Polynomials: The algebra of polynomials - Lagrange Interpolation - Polynomial Ideals -The prime factorization of a polynomial - Commutative rings – Determinant functions.

UNIT IV (18 Periods)

Determinants: Permutations and the uniqueness of determinants - Classical Adjoint of a (square) matrix - Inverse of an invertible matrix using determinants -Characteristic values - Annihilating polynomials.

UNIT V (18 Periods)

Diagonalization: Invariant subspaces - Simultaneous triangulation and simultaneous Diagonalization Direct - sum Decompositions - Invariant Direct sums – Primary Decomposition theorem.

UNIT VI (Advanced topics only for discussion)

Current contours:

Introduction to module theory

TEXTBOOK(S)

1. Kenneth Hoffman and Ray Alden Kunze, Linear Algebra, Second Edition, Prentice Hall of India Private Limited, New Delhi, 2005.
   - UNIT I - Chapter 1 & 2 Section 1.2-1.6 and 2.3
   - UNIT II - Chapter 3
   - UNIT III - Chapter 4 & 5 Section 4.1 - 4.5 and 5.1 - 5.2

UNIT IV - Chapter 5 & 6 Section 5.3, 5.4 and 6.1 - 6.3
UNIT V - Chapter 6 Section 6.4 - 6.8

BOOKS FOR REFERENCE

1. S. Kumaresan, Linear Algebra: A Geometric Approach, Prentice-Hall of India Ltd, 2004.
2. A.R. Rao, P. Bhimashankaram, Linear Algebra, Second Edition, Tata McGraw Hill, 2000

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Understand the concept of linear equations matrices and elementary row operations	K5
CO 2	Relate the linear transformations by matrices	K6
CO 3	Learn Lagrange interpolation, commutative ring	K4
CO 4	Realize important of diagonalization and sum decompositions	K4
CO 5	Understand inner product spaces and their properties	K3

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	S	M	S	S	S
CO 2	M	S	S	S	S
CO 3	S	S	S	S	M
CO 4	S	S	S	M	S
CO 5	S	S	M	S	S

S- Strong, M- Medium, L- Low

CORE COURSE - VI
COMPLEX ANALYSIS

Semester: II **Max. Marks: 75**
Course Code: 22PMM2C6 **Credit: 05**
Total Periods: 90 **Exam Hours: 03**

Objectives:

To learn the various intrinsic concepts and the theory of Complex Analysis and study the concept of Analyticity, Complex Integration and Infinite Products in depth

UNIT I (18 Periods)

Elementary Point Set Topology: Sets and Elements – Metric Spaces – Connectedness – Compactness – Continuous Functions – Topological Spaces; Conformality: Arcs and Closed Curves – Analytic Functions in Regions – Conformal Mapping – Length and Area; Linear Transformations: The Linear Group – The Cross Ratio – Symmetry

UNIT II (18 Periods)

Fundamental theorems in complex integration: Line Integrals – Rectifiable Arcs – Line Integrals as Functions of Arcs – Cauchy's Theorem for a Rectangle – Cauchy's Theorem in a Disk; Cauchy's Integral Formula: The Index of a Point with Respect to a Closed Curve – The Integral Formula – Higher Derivatives.

UNIT III (18 Periods)

Local Properties of Analytic Functions - Removable Singularities - Taylor's Theorem – Integral representation of the nth term - Zeros and Poles – Algebraic order of f(z) – Essential Singularity - The Local Mapping – The Open Mapping Theorem – The Maximum Principle.

UNIT IV (18 Periods)

The General Form of Cauchy's Theorem: Chains and Cycles – Simple Connectivity – Homology – The General Statement of Cauchy's Theorem – Proof of Cauchy's Theorem – Locally Exact Differentials – Multiply Connected Regions; The Calculus of Residues: The Residue Theorem – The Argument Principle – Evaluation of Definite Integrals

UNIT V (18 Periods)

Harmonic Functions: Definition and Basic Properties – The Mean-value Property – Poisson's Formula – Schwarz's Theorem – The Reflection Principle; Power series expansions-Weierstrass's Theorem – The Taylor Series – The Laurent Series;

UNIT VI (Advanced topics only for discussion)

Current contours:

Analytic continuation.

TEXT BOOK(S)

1. Lars V. Ahlfors, Complex Analysis, Third Ed. McGraw-Hill Book Company, Tokyo, 2013.
   UNIT – I -Chapter 3 Section 1.1 to 1.6, 2.1 to 2.4, 3.1-3.3
   UNIT – II -Chapter 4 Section 1.1 to 1.5, 2.1 to 2.3

UNIT – III -Chapter 4 Section 3.1, 3.2, 3.3, 3.4
UNIT – IV -Chapter 4 Section 4.1 to 4.7, 5.1 to 5.3
UNIT – V -Chapter 4 Section 6.1 to 6.5, and Chapter 5 Section 1.1 to 1.3

BOOKS FOR REFERENCE

1. Serge Lang, Complex Analysis, Addison Wesley, 1977.
2. Karunakaran, Complex Analysis, Alpha Science international Ltd, Second Edition,2005.

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Define and analyze limits and continuity for functions of complex variables	K4
CO 2	Evaluate complex cauchy's theorem for a rectangle	K5
CO 3	Understand the reflection principle	K6
CO 4	Evaluate chains and cycles and the calculus of residues	K5
CO 5	Explaining the concepts of local mapping theorem, caushy residue theorem and its application	K4

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	M	S	S	S	M
CO 2	S	S	M	S	S
CO 3	S	S	S	M	S
CO 4	S	M	S	S	S
CO 5	M	S	S	S	M

S- Strong, M- Medium, L- Low

CORE COURSE - VII
PARTIAL DIFFERENTIAL EQUATIONS

Semester: II **Max. Marks: 75**
Course Code: 22PMM2C7 **Credit: 05**
Total Periods: 90 **Exam Hours: 03**

Objectives:

To give an in-depth knowledge of solving partial differential equations and apply them in Scientific and Engineering problems and study the other aspects of PDE

UNIT I (18 Periods)

Partial differential equations- origins of first order Partial differential equations-Cauchy's problem for first order equations- Linear equations of the first order- Integral surfaces Passing through a Given curve- surfaces Orthogonal to a given system of surfaces -Nonlinear Partial differential equations of the first order.

UNIT II (18 Periods)

Cauchy's method of characteristics- compatible systems of first order equations - Charpits method- Special types of first order equations- Solutions satisfying given conditions- Jacobi's method

UNIT III (18 Periods)

Partial differential equations of the second order: The origin of second order equations– second order equations in Physics – Higher order equations in Physics - Linear partial differential equations with constant co-efficient- Equations with variable coefficients-Characteristic curves of second order equations

UNIT IV (18 Periods)

Characteristics of equations in three variables - The solution of Linear Hyperbolic equations -Separation of variables. The method of Integral Transforms – Non-Linear equations of the second order

UNIT V (18 Periods)

Laplace equation - Elementary solutions of Laplace's Equations-Families of equipotential Surfaces- Boundary value problems-Separation of variables –Problems with Axial Symmetry

UNIT VI (Advanced topics only for discussion)

Current contours:

Green's function-theory of distributions.

TEXT BOOK(S)

1. Ian N. Sneddon, Elements of Partial differential equations**,** Dover Publication –INC, New York, 2006.

   UNIT I - Chapter 2 Sections 1 to 7

UNIT II - Chapter 2 Sections 8 to 13
UNIT III - Chapter 3 Sections 1 to 6
UNIT IV - Chapter 3 Sections 7 to 11
UNIT V - Chapter 4 Sections 2 to 6

BOOKS FOR REFERENCE

1. M.D. Raisinghania, Advanced Differential Equations, S. Chand and company Ltd., New Delhi,2001
2. E.T. Copson**,** Partial Differential Equations, Cambridge University Press

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Know the basics of origins of first order partial differential equations	K4
CO 2	Analyze the special types of first order equation	K5
CO 3	Solve the method of integral transforms	K3
CO 4	Represent the Laplace equation and boundary value problems	K6
CO 5	Finding the solutions of the heat equation, wave equation and the laplace equation subject to boundary condition	K5

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	M	S	S	M	S
CO 2	M	M	S	S	S
CO 3	S	S	M	S	S
CO 4	S	S	S	S	M
CO 5	S	M	S	S	S

S- Strong, M- Medium, L- Low

CORE COURSE - VIII
FLUID DYNAMICS

Semester: II **Max. Marks: 75**
Course Code: 22PMM2C8 **Credit: 05**
Total Periods: 90 **Exam Hours: 03**

Objectives:

To give the students an introduction to the behavior of fluids in motion and the students a feel of the applications of Complex Analysis in the analysis of the flow of liquids

UNIT I (18 Periods)

Real Fluids and Ideal Fluids - Velocity of a Fluid at a point – Streamlines and Path lines: Steady and Unsteady Flows – The Velocity potential – The Velocity vector – Local and Particle Rates of Change – The Equation of continuity – Worked examples – Acceleration of a Fluid – Conditions at a rigid boundary – General analysis of fluid motion – Pressure at a point in a Fluid at Rest – Pressure at a point in Moving Fluid – Conditions at a Boundary of Two Inviscid Immiscible Fluids – Euler's equation of motion – Bernoulli's equation – Worked example

UNIT II (18 Periods)

Discussions of a case of steady motion under conservative body forces – Some potential theorems – Some Flows Involving Axial Symmetry – Some special two- Dimensional Flows- Impulsive Motion. Some three- dimensional Flows: Introduction – Sources, Sinks and Doublets – Images in a Rigid infinite Plane – Axi-Symmetric Flows; Stokes stream function.

UNIT III (18 Periods)

Some Two- Dimensional Flows: Meaning of a Two- Dimensional Flow – Use of cylindrical polar co-ordinates – The stream function – The Complex Potential for Two-Dimensional, Irrotational , Incompressible Flow – complex velocity potentials for Standard Two Dimensional Flows – Some worked examples – The Milne- Thomson circle theorem and applications – The theorem of Blasius.

UNIT IV (18 Periods)

The use of conformal Transformation and Hydro dynamical Aspects – Vortex rows. Viscous flow Stress components in a real fluid - relations between cartesian components of stress - Translational Motion of Fluid element – The Rate of Strain Quadraic and Principle Stresses – Some further properties of the rate of strain quardric - Stress analysis in fluid motion – Relations between stress and rate of strain - The coefficient of viscosity and laminar flow – The Navier-Stokes equations of motion of a viscous fluid.

UNIT V (18 Periods)

Some solvable problems in viscous flow – Steady viscous flow in tubes of uniform cross section – Diffusion of vorticity – Energy Dissipation due to viscosity – Steady Flow past a Fixed Sphere – Dimensional Analysis; Reynolds Number – Prandtl's Boundary Layer.

UNIT VI(Advanced topics only for discussion)

Current contours:

Gas dynamics and magneto hydro dynamics.

TEXT BOOK(S)

1. Text Book of Fluid Dynamics by F.Chorlton , CBS Publishers & Distributors, New Delhi ,1985.
   UNIT I - Chapter 2 and Chapter 3 Section 3.1 to 3.6
   UNIT II - Chapter 3 Section 3.7 to 3.11 and chapter 4 Section 4.1, 4.2, 4.3, 4.5
   UNIT II - Chapter 5 Section 5.1 to 5.9 except 5.7
   UNIT IV - Chapter 5 Section 5.10, 5.12 and Chapter 8 Section 8.1 to 8.9
   UNIT V - Chapter 8 Section 8.10 to 8.16.

BOOKS FOR REFERENCE

1. Computational Fluid Dynamics: An Introduction, J.F. Wendt J.D. Anderson, G. Degrez and E. Dick, Springer – Verlag, 1996.
2. Computational Fluid Dynamics, The Basics with Applicatios, J. D. Anderson, McGraw Hill,1995.

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Differentiate the real fluids and ideal fluids	K4
CO 2	Discussion of some flows involving axial symmetry	K5
CO 3	Understanding the concept of stream function and some worked example	K6
CO 4	Obtain some solvable problems in viscous flow	K5
CO 5	Describe the principles of motion for fluids	K3

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	S	S	M	S	S
CO 2	S	M	S	S	S
CO 3	S	S	S	S	M
CO 4	M	S	S	S	S
CO 5	M	S	M	S	S

S- Strong, M- Medium, L- Low

INDUSTRIAL BASED COURSE
MATHEMATICAL MODELING

Semester : II **Max. Marks: 75**
Course Code: 22PMM2I1 **Credit: 02**
Total Periods: 90 **Exam Hours: 03**

Objectives:

To study the mathematical models through ODE and Difference equations and train the studentss to develop mathematical models in real life problems

UNIT I (18 Periods)

Mathematical Modeling through Ordinary Differential Equationsof First order**:** Linear Growth and Decay Models – Non-Linear Growth and Decay Models –Compartment Models – Dynamics problems – Geometrical problems.

UNIT II (18 Periods)

Mathematical Modeling through Systems of OrdinaryDifferential Equations of First Order: Population Dynamics – Epidemics – Compartment Models – Economics –Medicine, Arms Race, Battles and International Trade – Dynamics.

UNIT III (18 Periods)

Mathematical Modeling through Ordinary Differential Equationsof Second Order: Planetary Motions – Circular Motion and Motion of Satellites – Mathematical Modeling through Linear Differential Equations of Second Order –Miscellaneous Mathematical Models.

UNIT IV (18 Periods)

Mathematical Modeling through Difference Equations: Simple Models – Basic Theory of Linear Difference Equations with ConstantCoefficients – Economics and Finance – Population Dynamics and Genetics –Probability Theory

UNIT V (18 Periods)

Mathematical Modeling through Graphs: Solutions that can be Modeled through Graphs – Mathematical Modeling in Terms of Directed Graphs, Signed Graphs, Weighted Digraphs and Unoriented Graphs.

TEXT BOOK(S)

1. J.N. Kapur, Mathematical Modeling, Wiley Eastern Limited, New Delhi, 1988.

UNIT I - Chapter 2 Sections 2.1 to 2.6
UNIT II - Chapter 3 Sections 3.1 to 3.6
UNIT III - Chapter 4 Sections 4.1 to 4.4
UNIT IV - Chapter 5 Sections 5.1 to 5.5
UNIT V - Chapter 7 Sections 7.1 to 7.5

BOOK FOR REFERENCE

1. J. N. Kapur, Mathematical Models in Biology and Medicine, EWP New Delhi, 1985.

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Analyze the mathematical modeling through ordinary differential equation	K4
CO 2	Compare the difference of planetary motion and circular motion	K5
CO 3	Determine the linear difference equations with constant coefficients	K3
CO 4	Illustrate mathematical modeling through graphs	K6
CO 5	Take an analytical approach to problem in their future endeavors	K5

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	M	S	S	S	M
CO 2	S	S	M	S	S
CO 3	S	S	S	S	S
CO 4	S	S	S	M	M
CO 5	S	M	M	S	S

S- Strong, M- Medium, L- Low

NON MAJOR ELECTIVE - I
QUANTITATIVE APTITUDE-I

Semester: II **Max. Marks: 75**

Course Code: 22PMM2N1A **Credit: 02**

Total Periods: 90 **Exam Hours: 03**

Objectives:

To introduce the various techniques of Operations Research and make the students solve real life problems in Business and Management

UNIT I (18 Periods)

Number system, decimals, fractions

UNIT II (18 Periods)

LCM, HCF, Ratio and Proportions.

UNIT III (18 Periods)

Mensuration, Time and Work, Time and Distance

UNIT IV (18 Periods)

Percentage, Simple and Compound interest, Profit and Loss.

UNIT V (18 Periods)

Elementary algebra, Geometry and Trigonometry, Elementary statistics.

UNIT VI (Advanced topics only for discussion)

Current contours:

Discuss about state and national level competitive exams.

TEXT BOOK(S)

1. R.V. Praveen, "Quantitative Aptitude and Reasoning", Second edition PHI learning private limited, Delhi-2013

BOOKS FOR REFERENCE

1. Scope and treatment as in "Quantitative aptitude" by R.S. Aggrawal, S. Chand and Company Ltd Ram nagar, New delhi (2007).

UNIT I- Chapter 13

UNIT II- Chapter 1 and 4

UNIT III- Chapter 19, 26,27 and 29

UNIT IV – Chapter 5,8, 17 and 18

UNIT V- Chapter 14,15

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Formulate and solution of integer programming	K4
CO 2	Solve dynamic(Multistage) programming	K5
CO 3	Design and implement the inventory model	K5
CO 4	Illustrate the non- linear programming algorithms	K3
CO 5	Increasing the effectiveness of management decisions	K6

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	M	S	S	S	S
CO 2	S	S	S	M	S
CO 3	S	S	S	S	M
CO 4	S	S	S	S	M
CO 5	S	M	M	S	S

S- Strong, M- Medium, L- Low

NON-MAJOR ELECTIVE - I
NUMERICAL METHODS AND STATISTICS

Semester: II **Max. Marks: 75**

Course Code: 22PMM2N1B **Credit: 02**

Total Periods: 90 **Exam Hours: 03**

Objectives:

To introduce the various techniques of Operations Research and make the students solve real life problems in Business and Management

UNIT I (18 Periods)

Number system, decimals, fractions

UNIT II (18 Periods)

LCM, HCF, Ratio and Proportions.

UNIT III (18 Periods)

Mensuration, Time and Work, Time and Distance

UNIT IV (18 Periods)

Percentage, Simple and Compound interest, Profit and Loss.

UNIT V (18 Periods)

Elementary algebra, Geometry and Trigonometry, Elementary statistics.

UNIT VI (Advanced topics only for discussion)

Current contours:

Discuss about state and national level competitive exams.

TEXT BOOK(S)

BOOKS FOR REFERENCE

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Formulate and solution of integer programming	K4

CO 2	Solve dynamic(Multistage) programming	K5
CO 3	Design and implement the inventory model	K5
CO 4	Illustrate the non- linear programming algorithms	K3
CO 5	Increasing the effectiveness of management decisions	K6

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	M	S	S	S	S
CO 2	S	S	S	M	S
CO 3	S	S	S	S	M
CO 4	S	S	S	S	M
CO 5	S	M	M	S	S

S- Strong, M- Medium, L- Low

CORE COURSE - IX
TOPOLOGY

Semester: III **Max. Marks: 75**
Course Code: 22PMM3C9 **Credit: 05**
Total Periods: 90 **Exam Hours: 03**

Objectives:

To study the concepts concerned with properties that are preserved under continuous deformations of objects and train the students to develop analytical thinking and the study of continuity and connectivity.

UNIT I (18 Periods)

Topological Spaces: Topological spaces - Basis for a topology - The order topology - The product topology on X &Y - The subspace topology - Closed sets and limit points.

UNIT II (18 Periods)

Continuous Functions: Continuous functions - the product topology - The metric topology.

UNIT III (18 Periods)

Connectedness: Connected spaces- connected subspaces of the Real line - Components and local connectedness.

UNIT IV (18 Periods)

Compactness: Compact spaces - compact subspaces of the Real line - Limit Point Compactness –Local Compactness.

UNIT V (18 Periods)

Countability And Separation Axioms: The countability Axioms - The separation Axioms - Normal spaces - The Urysohn Lemma - The Urysohn metrization Theorem - The Tietz extension theorem.

UNIT VI(Advanced topics only for discussion)

Current contours:

Elementary concepts from algebraic topology.

TEXT BOOK(S)

1.James R. Munkres, Topology (2nd Edition) Pearson Education Pvt. Ltd., New Delhi-2002 (Third Indian Reprint).

UNIT I - Chapter 2 Sections 12 to 17
UNIT II - Chapter 2 Sections 18 to 21 (Omit Section 22)
UNIT III - Chapter 3 Sections 23 to 25.
UNIT IV - Chapter 3 Sections 26 to 29.
UNIT V - Chapter 4 Sections 30 to 35.

BOOKS FOR REFERENCE

1 J. Dugundji, Topology, Prentice Hall of India, New Delhi, 1975.

2 L. Steen and J. Seeback, Counter examples in Topology, Holt, Rinehart and Winston, New York, 1970.

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Understanding the concept of theory of equations	K4
CO 2	Realize the sum of the powers of the roots of an equation	K5
CO 3	Learn about reciprocal roots and reciprocal equations	K3
CO 4	Know the basic of method of successive differentiation	K6
CO 5	Analyzing the concepts of limit point compactness and local compactness	K4

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	M	S	S	S	M
CO 2	S	M	S	S	S
CO 3	S	S	S	S	S
CO 4	M	S	S	S	M
CO 5	S	S	S	M	S

S- Strong, M- Medium, L- Low

CORE COURSE - X
MEASURE THEORY AND INTEGRATION

Semester: III **Max. Marks: 75**
Course Code: 22PMM3C10 **Credit: 05**
Total Periods: 90 **Exam Hours: 03**

Objectives:

To generalize the concept of integration using measures and develops the concept of analysis in abstract situations

UNIT I (18 Periods)

Measure on Real line - Lebesgue outer measure - Measurable sets - Regularity -Measurable function - Borel and Lebesgue measurability

UNIT II (18 Periods)

Integration of non-negative functions - The General integral - Integration of series - Riemann and Lebesgue integrals.

UNIT III (18 Periods)

Abstract Measure spaces - Measures and outer measures - Completion of a measure - Measure spaces - Integration with respect to a measure

UNIT IV (18 Periods)

Convergence in Measure- Almost uniform convergence - Signed Measures and Halin Decomposition - The Jordan Decomposition

UNIT V (18 Periods)

Measurability in a Product space – The product Measure and Fubini's Theorem

UNIT VI(Advanced topics only for discussion)

Current contours:

Riesz- Markov Kakutani theorem.

TEXT BOOK(S)

1. G. De Barra, Measure Theory and Integration, New age international (p) Limited.
   - UNIT I - Chapter 2 Sections 2.1 to 2.5
   - UNIT II - Chapter 3 Sections 3.1 to 3.4
   - UNIT III - Chapter 5 Sections 5.1 to 5.6
   - UNIT IV - Chapter 7 Sections 7.1 and 7.2, Chapter 8 Sections 8.1 and 8.2
   - UNIT V - Chapter 10 Sections 10.1 and 10.2

BOOKS FOR REFERENCE

1. P.K. Jain, V.P. Gupta, Lebesgue Measure and Integration, New Age International Pvt Limited Publishers, New Delhi, 1986, Reprint 2000.
2. Richard L. Wheeden and AntoniZygmund, Measure and Integral: An Introduction to Real Analysis, Marcel Dekker Inc. 1977

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Understand the lebesgue out measure	K4
CO 2	Evaluate the abstract measure spaces	K5
CO 3	Define signed measures and halin decomposition	K6
CO 4	Analysis the product measure and fubini's theorem	K4
CO 5	Understanding basic concepts of measure and integration	K3

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	S	S	M	S	M
CO 2	S	S	S	S	S
CO 3	M	S	S	M	S
CO 4	S	S	S	S	M
CO 5	S	M	M	S	S

S- Strong, M- Medium, L- Low

CORE COURSE - XI
CLASSICAL DYNAMICS

Semester: III **Max. Marks: 75**
Course Code: 22PMM3C11 **Credit: 05**
Total Periods: 90 **Exam Hours: 03**

Objectives:

To give a detailed knowledge of the mechanical system of particles and study the applications of Lagrange's and Hamilton's equations

UNIT I (18 Periods)

Introductory concepts: The mechanical system - Generalized Coordinates - constraints - virtual work - Energy and momentum.

UNIT II (18 Periods)

Lagrange's equation: Derivation and examples - Integrals of the Motion – Small oscillations.

UNIT III (18 Periods)

Special Applications of Lagrange's Equations: Rayleigh's dissipation function - impulsive motion - Gyroscopic systems - velocity dependent potentials.

UNIT IV (18 Periods)

Hamilton's equations: Hamilton's principle - Hamilton's equations – Other variational principles - phase space

UNIT V (18 Periods)

Hamilton - Jacobi Theory: Hamilton's Principal Function – The Hamilton - Jacobi equation - Separability.

UNIT VI(Advanced topics only for discussion)

Current contours:

Introduction to relativity.

TEXT BOOK(S)

1. Donald T. Greenwood, Classical Dynamics, PHI Pvt. Ltd., New Delhi-1985

UNIT I - Chapter 1 Sections 1.1 to 1.5

UNIT II - Chapter 2 Sections 2.1 to 2.4

UNIT III - Chapter 3 Sections 3.1 to 3.4

UNIT IV - Chapter 4 Sections 4.1 to 4.4

UNIT V - Chapter 5 Sections 5.1 to 5.3

BOOKS FOR REFERENCE

1. H. Goldstein, Classical Mechanics, (2nd Edition), Narosa Publishing House, New Delhi

2. Narayan Chandra Rana & Promod Sharad Chandra Joag, Classical Mechanics, Tata Mc Graw Hill, 1991.

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Realize the mechanical system and applications of lagrange's	K3
CO 2	Solve the derivation and examples of lagrange's equation	K4
CO 3	Understanding the concept of hamilton's equations	K4
CO 4	Understand the dynamical system based on the laws governing oscillations	K5
CO 5	Understand the motion of a mechanical system using langrange Hamilton formalism.	K5

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	M	S	S	S	S
CO 2	S	S	M	S	M
CO 3	S	S	S	S	S
CO 4	M	S	S	S	S
CO 5	S	M	S	S	S

S- Strong, M- Medium, L- Low

CORE COURSE - XII
CALCULUS OF VARIATIONS, TRANSFORMS AND INTEGRAL EQUATIONS

Semester: III **Max. Marks: 75**
Course Code: 22PMM3C12 **Credit: 05**
Total Periods: 90 **Exam Hours: 03**

Objectives:

To introduce the concept of calculus of variations and integral equations and their applications and study the different types of transforms and their properties.

UNIT I (18 Periods)

Calculus of variations – Maxima and Minima – the simplest case – Natural boundary and transition conditions - variational notation – more general case – constraints and Lagrange's multipliers – variable end points – Sturm - Liouville problems.

UNIT II (18 Periods)

Fourier transform - Fourier sine and cosine transforms - Properties Convolution -Solving integral equations - Finite Fourier transform - Finite Fourier sine and cosine transforms - Fourier integral theorem - Parseval's identity.

UNIT III (18 Periods)

Hankel Transform -Definition – Inverse formula – Some important results for Bessel function – Linearity property – Hankel Transform of the derivatives of the function – Hankel Transform of differential operators – Parseval's Theorem

UNIT IV **(18 Periods)**

Linear Integral Equations - Definition, Regularity conditions – special kind of kernels – eigen values and eigen functions – convolution Integral – the inner and scalar product of two functions – Notation – reduction to a system of Algebraic equations – examples – Fredholm alternative - examples – an approximate method.

UNIT V **(18 Periods)**

Method of successive approximations: Iterative scheme – examples – Volterra Integral equation – examples – some results about the resolvent kernel. Classical Fredholm Theory: the method of solution of Fredholm – Fredholm's first theorem – second theorem – third theorem.

UNIT VI(Advanced topics only for discussion)

Current contours:

Variational problems in fluid flow and heat transfer.

TEXT BOOK(S)

1. Ram.P.Kanwal – Linear Integral Equations Theory and Practise, Academic Press1971.
2. F.B. Hildebrand, Methods of Applied Mathematics II ed. PHI, ND 1972

3. A.R. Vasishtha, R.K. Gupta, Integral Transforms, Krishna Prakashan Media Pvt Ltd, India, 2002.

UNIT I - Chapter 2 Sections 2.1 to 2.9 of [2]
UNIT II - Chapter 7 of [3]
UNIT III - Chapter 9 of [3]
UNIT IV - Chapters 1 and 2 of [1]
UNIT V - Chapters 3 and 4 of [1]

BOOKS FOR REFERENCE

1. S.J. Mikhlin, Linear Integral Equations (translated from Russian), Hindustan Book Agency, 1960.
2. I.N. Snedden, Mixed Boundary Value Problems in Potential Theory, North Holland, 1966

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Realize the importance of calculus of variations and some general case	K3
CO 2	Compare Fourier sine and cosine transforms and finite Fourier transforms	K4
CO 3	Calculate the Henkel transforms of the derivatives of the function	K5
CO 4	Solve the method of successive approximations by using iterative scheme	K5
CO 5	Solve boundary values problem through integral equation using green's function	K6

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	S	M	S	M	S
CO 2	S	S	S	S	S
CO 3	M	S	S	S	S
CO 4	S	S	M	S	M
CO 5	S	M	M	S	S

S- Strong, M- Medium, L- Low

NON MAJOR ELECTIVE – II
QUANTITATIVE APTITUDE-II

Semester: III **Max. Marks: 75**
Course Code: 22PMM3N2A **Credit: 02**
Total Periods: 90 **Exam Hours: 03**

Objectives:

To learn the problems solving techniques for aptitude problems and enable to students prepare themselves for various competitive examinations.

UNIT I:

Simplication and approximation, data Interpretation, Data sufficiency.

UNIT II:

Quadratic equations, Averages, Boat and Streams.

UNIT III:

Mixtures and allegation, permutation and combination.

UNIT IV:

Probability, partnership, pipes and cistern.

UNIT V:

Clocks, partnership, logarithms, age problems.

UNIT VI(Advanced topic only for discussion)

Current contours:

Discuss many problems.

TEXT BOOK(S)

1. R.V. Praveen, "Quantitative Aptitude and Reasoning", Second edition PHI learning private limited, Delhi-2013

BOOKS FOR REFERENCE

1. Scope and treatment as in "Quantitative aptitude" by R.S. Aggrawal, S. Chand and Company Ltd Ram nagar, New delhi (2007).

UNIT I- Chapter 13

UNIT II- Chapter 1 and 4

UNIT III- Chapter 19, 26,27 and 29

UNIT IV – Chapter 5,8, 17 and 18

UNIT V- Chapter 14,15

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Gain knowledge about different data type and different data structures in R	K4
CO 2	Understand basic regular expressions in R	K5
CO 3	Apply the various graphics in R for data visualization.	K5
CO 4	Analyze data and generate reports based on the data	K6
CO 5	Analyze the uses of R for descriptive statistics and inferential statistics.	K5

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	S	S	M	S	S
CO 2	S	S	S	S	M
CO 3	M	S	S	S	S
CO 4	M	S	S	S	S
CO 5	S	M	S	M	S

S- Strong, M- Medium, L- Low

NON MAJOR ELECTIVE – II
R PROGRAMMING

Semester: III **Max. Marks: 75**
Course Code: 22PMM3N2B **Credit: 02**
Total Periods: 90 **Exam Hours: 03**

Objectives:

Know all needed terms for writing R Programme and meet the global requirement in software industries.

UNIT I:

Basic Mathematical Commands – Diagrams

UNIT II:

Plotting the Curve – The Measure of Central Tendency

UNIT III:

Measure of Dispersion – Skewness, Moments, kurtosis

UNIT IV:

Standard Distribution – Test of Hypothesis

UNIT V:

Correlation – Regression

UNIT VI(Advanced topic only for discussion)

Current contours:

Uber data analysis in R-programming

TEXT BOOK:

1. Paul Teeter, R Cook Book, O'Reilly Publication, 1st Edition, 2014.

REFERENCE BOOK:

1. Mark Gardener, Beginning R- The Statistical Programming Language, Willey Publication 2015.

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Gain knowledge about different data type and different data structures in R	K4
CO 2	Understand basic regular expressions in R	K5
CO 3	Apply the various graphics in R for data visualization.	K5
CO 4	Analyze data and generate reports based on the data	K6
CO 5	Analyze the uses of R for descriptive statistics and inferential statistics.	K5

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	S	S	M	S	S
CO 2	S	S	S	S	M
CO 3	M	S	S	S	S
CO 4	M	S	S	S	S
CO 5	S	M	S	M	S

S- Strong, M- Medium, L- Low

FOR ALL PG PROGRAMMES

SKILL ORIENTED COURSE

SOFT SKILLS

Semester-III **Max.Marks:75**
Course Code: 22P3SB **Credit: 3**
Total Periods: 45 **Exam Hrs: 3**

OBJECTIVE:

- To Develop Students' Effective communication skills (LSRW) and presentation skills.
- To make the students as self-confident individuals by mastering inter-personal skills, team management skills, and leadership skills.
- To develop the students' personalities with a mature outlook to function effectively in different circumstances.

UNIT I: Communication Skill (8 Pds)

Principles of communication: LSRW in communication. What is meant by LSRW Skills – Why it is important – How it is useful – How to develop the skills? Oral – Speaking words, articulation, speaking clearly. Written communication – Generating ideas/ gathering data organizing ideas.

UNIT II: Personality Enrichment (9 Pds)

Goal Setting and Managing Time - The basis of effective goals – steps to be followed to obtain optimum results from goal setting – Identifying the reasons for procrastination – guidelines to overcome procrastination – priority management at home and college.

UNIT III: Interview Skill (10 Pds)

Interviews – Types of Interviews, preparing for interviews, facing interviews, reviewing performance, participating in mock interviews. Team work and participating in group discussions – Team building and Team work, Team briefing, Role of Team leader, Conflict resolution, Methods of Group discussions, Role Functions in Group Discussion, Types of Non – functional Behavior, Improving group performance. Participating in Mock group discussions.

UNIT IV: Computing Skill (9 Pds)

Basic Microsoft word- Basic Microsoft Excel- **Formulas and Functions in Microsoft Excel-Microsoft PowerPoint-** Graphics- Multimedia - Spreadsheets - Databases-Search tools-Blog creation

UNIT V: Presentation Skill (9 Pds)

Presentations – Non-verbal communication – Body language, Signs and symbols, Territory/Zone, Object language. Preparing successful presentations, thinking about audience, making effective use of visual aid, Delivering presentation, using prompts, dealing with questions and interruptions, Mock presentations.

REFERENCE BOOK

1. Peter, Francis. Soft Skills and Professional Communication. New Delhi: Tata McGraw Hill. 2012. Print.

2. Sherfield, R. M. ; Montgomery, R.J. and Moody, P, G. (2010). Developing Soft Skills. 4th ed. New Delhi: Pearson. Working In Microsoft office 2011– Ron Mansfield , Tata Mc-Graw Hill, India.

SYLLABUS

EMPLOYABILITY SKILLS

Sem: III **Max mark:100***
Cousrsecode:22P3ES **Credit : 02***
Total Period: 45 **Exam Hrs.3hrs**

Objectives

1. To enable the students to know and understand the concepts related to employability.
2. To develop and provide basic analytical and reasoning skills of the students to improve their ability
3. To increase the competence level and ability to interact effectively both at the work place and outside the work place.

UNIT -I

Introduction To Employability Skills – Meaning-Employability skills and employment skills- Employability attributes-vocational skills and Employability skills-purposes and examples.

UNIT –II

Behavioral Skills -English Literacy Skills -It Literacy Skills - Entrepreneurship Skills - Maintaining Efficiency at Workplace- Communication.

UNIT –III

Essential Skills for Success -Reading and Writing Skills – Dimension Of Competency-Task Skills-Task Management skills-contingency management skills -job role environment skills

UNIT -IV

Inter-relationships of employability -team work-problem solving -relationship building skills - creative thinking and influencing skills- leadership skills-success stories of individuals.

UNIT – V

Resume writing -cv and resume-meaning -difference-features of a good resume – etiquettes -employment sickly-meaning -process- steps-job-search websites.

BOOKS (REFERENCE)

1.WINNING interview skils, Compiled and edited by j.k chopra.

2.A modern approach to verbal and non- verbal reasoning, R.S. Aggarwal.

3.Developing grauaduate employability skills your pathway to employment by MERCI. V. CHAITA

REFERENCE BOOKS

1. Soft Skills - Enhancing Employability: Connecting Campus with Corporate by M. S. Rao.
2. Enhancing Employability @ Soft Skills by Shalini Verma Pearson Education
3. Resume To HR Interview Prep (Employability Enhancement Series) by Rajesh Vartak

CORE COURSE - XIII
FUNCTIONAL ANALYSIS

Semester: IV **Max. Marks: 75**
Course Code: 22PMM4C13 **Credit: 05**
Total Periods: 90 **Exam Hours: 03**

Objectives

To study the three structure theorems of Functional Analysis viz., Hahn-Banach theorem, Open mapping theorem and Uniform boundedness principle and introduce Hilbert spaces and operator theory leading to the spectral theory of operators on a Hilbert space.

UNIT I (18 Periods)

Algebraic Systems: Groups – Rings – The structure of rings – Linear spaces – The dimension of a linear space – Linear transformations – Algebras – Banach Spaces : The definition and some examples – Continuous linear transformations – The Hahn- Banach theorem – The natural imbedding of N in N** - The open mapping theorem –The conjugate of an operator

UNIT II (18 Periods)

Hilbert Spaces: The definition and some simple properties – Orthogonal complements – Orthonormal sets - The conjugate space H* - The adjoint of an operator – Self-adjoint operators – Normal and unitary operators – Projections

UNIT III (18 Periods)

Finite-Dimensional Spectral Theory: Matrices – Determinants and the spectrum of an operator – The spectral theorem – A survey of the situation

UNIT IV (18 Periods)

General Preliminaries on Banach Algebras: The definition and some examples –Regular and singular elements – Topological divisors of zero – The spectrum – The formula for the spectral radius – The radical and semi-simplicity

UNIT V (18 Periods)

The Structure of Commutative BanachAlgebras: The Gelfand mapping – Applications of the formula $r(x) = \lim \| x^n \|1/n$ - Involutions in Banach Algebras – The Gelfand- Neumark theorem.

UNIT VI(Advanced topics only for discussion)

Current contours:

Discussion on compact operators.

TEXT BOOK(S)

1. G.F.Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill International Ed. 1963.

UNIT I - Chapters 8 and 9
UNIT II - Chapter 10
UNIT III - Chapter 11
UNIT IV - Chapter 12
UNIT V - Chapter 13

BOOKS FOR REFERENCE

1 Walter Rudin, Functional Analysis, TMH Edition, 1974.

2 B.V. Limaye, Functional Analysis, Wiley Eastern Limited, Bombay, Second Print, 1985.

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Relate groups and rings in algebraic system	K4
CO 2	Know the concept of Hilbert spaces and some simple properties	K5
CO 3	Calculate the matrices and determinants and the spectral operator	K5
CO 4	Understanding the concept of general preliminaries on banach algebras	K6
CO 5	Construct banach algebras through banach spaces	K5

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	S	S	M	S	S
CO 2	S	S	S	S	M
CO 3	M	S	S	S	S
CO 4	M	S	S	S	S
CO 5	S	M	S	M	S

S- Strong, M- Medium, L- Low

CORE COURSE - XIV
NUMERICAL ANALYSIS

Semester: IV **Max. Marks: 75**

Course Code: 22PMM4C14 **Credit: 05**

Total Periods: 90 **Exam Hours: 03**

Objectives:

To know the theory behind various numerical methods and to apply these methods to solve mathematical problems

UNIT I (18 Periods)

Transcendental and polynomial equations:Rate of convergence – Secant Method, Regula Falsi Method, Newton Raphson Method, Muller Method and Chebyshev Method. Iterative Methods: Birge-Vieta method, Bairstow's method -Direct Method: Graeffe's root squaring method.

UNIT II (18 Periods)

System of Linear Algebraic equations: Error Analysis of Direct methods – Operational count of Gauss elimination, Vector norm, Matrix norm, Error Estimate. Iteration methods - Jacobi iteration method, Gauss Seidel Iteration method, Successive Over Relaxation method - Convergence analysis of iterative methods, Optimal Relaxation parameter for the SOR method.

UNIT III (18 Periods)

Interpolation and Approximation: Hermite Interpolations, Piecewise and Spline Interpolation –piecewise linear interpolation, piecewise quadratic interpolation, piecewise cubic interpolation, spline interpolation-cubic Spline interpolation. Bivariate Interpolation - Lagrange Bivariate interpolation. Least square approximation

UNIT IV (18 Periods)

Differentiation and Integration: Numerical Differentiation – Optimum choice of Step length – Extrapolation methods – Partial Differentiation. Numerical Integration: Methods based on undetermined coefficients - Gauss Legendre Integration method and Lobatto Integration Methods only.

UNIT V (18 Periods)

Ordinary differential equations – Single step Methods: Local truncation error or Discretization Error, Order of a method, Taylor Series method, Runge-Kutta methods: Explicit Runge–Kutta methods– Minimization of Local Truncation Error, System of Equations, Implicit Runge-Kutta methods. Stability analysis of single step methods (RK methods only)

UNIT VI (Advanced topics only for discussion)

Current contours:

Method for partial differential equations.

TEXT BOOK(S)

1. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International (p) Limited Publishers, New Delhi, Third Edition 2012

UNIT I - Chapter 2 Section 2.5 & 2.8
UNIT II - Chapter 3 Section 3.3, 3.4
UNIT III - Chapter 4 Section 4.4 - 4.7 & 4.9
UNIT IV - Chapter 5 Section 5.2 - 5.6 & 5.8
UNIT V - Chapter 6 Section 6.3 & 6.6

BOOKS FOR REFERENCE

1. Kendall E. Atkinson, An Introduction to Numerical Analysis, II Edn., John Wiley & Sons, 1988.
2. M.K. Jain, Numerical Solution of Differential Equations, II Edn., New Age International Pvt Ltd., 1983.
3. Samuel. D. Conte, Carl. De Boor, Elementary Numerical Analysis, Mc Graw-Hill International Edn., 1983.

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	To calculate the transcendental and polynomial equation	K4
CO 2	Determine the system of linear algebraic equation	K5
CO 3	Classify numerical differentiation and numerical integration	K3
CO 4	Solve the ordinary differential equations using singsletep method	K6
CO 5	Research numerical solution of differential equation system	K5

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	S	S	M	S	S
CO 2	S	S	S	S	M
CO 3	M	S	S	S	S
CO 4	S	S	M	S	S
CO 5	S	M	S	S	S

S- Strong, M- Medium, L- Low

CORE ELECTIVE COURSE - II
FUZZY MATHEMATICS

Semester: IV **Max. Marks: 75**

Course Code: 22PMM4E2A **Credit: 04**

Total Periods: 90 **Exam Hours: 03**

Objectives:

To introduce the notion of Fuzzy numbers and Fuzzy relation.

UNIT I (18 Periods)

Fuzzy sets – Basic types – Basic concept – α-cuts – Additional properties of α-cuts – Extension principle for Fuzzy sets

UNIT II (18 Periods)

Operations on Fuzzy sets – Types of operations – Fuzzy complements – t-Norms– Fuzzy Unions – Combinations of operations.

UNIT III (18 Periods)

Fuzzy Arithmetic – Fuzzy numbers – Arithmetic operations on intervals –Arithmetic operations on Fuzzy numbers.

UNIT IV (18 Periods)

Fuzzy relations – Binary fuzzy relations – Fuzzy equivalence relations – Fuzzy compatibility relations – Fuzzy ordering relations – fuzzy morphisms

UNIT V (18 Periods)

Fuzzy Relation Equations – General discussion – Problem partitioning – Solution method – Fuzzy Relation Equations based on Sup-i Compositions – Fuzzy Relation Equations based on inf-ωi Compositions.

UNIT VI(Advanced topic only for discussion)

Current contours:

Discuss about fuzzy logic and fuzzy set theory.

TEXT BOOK(S)

1. George J.Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic, Prentice Hall of India, New Delhi, 2004.

UNIT I	- Chapter 1 Sections 1.4; Chapter 2 Sections 2.1 & 2.3
UNIT II	- Chapter 3 Sections 3.1 to 3.5
UNIT III	- Chapter 4 Sections 4.1 to 4.4
UNIT IV	- Chapter 5 Sections 5.3 to 5.8
UNIT V	- Chapter 6 Sections 6.1 to 6.5

BOOKS FOR REFERENCE

1. H.J. Zimmermann, Fuzzy Set Theory and its Applications, Allied Publishers Limited, New
   Delhi, 1991.
2. G.J. Klir and B. Yuan, Fuzzy Sets and Fuzzy Logic, Prentice Hall of India, New Delhi, 1995

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Understanding the concept of fuzzy sets and extension principle of fuzzy set	K4
CO 2	Appreciate the operation on fuzzy sets	K3
CO 3	Solve fuzzy relation and fuzzy Morphism	K5
CO 4	Solve fuzzy relation equation based on sup-i compositions	K6
CO 5	Find crisp and fuzzy set and discuss the types of fuzzy sets	K5

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	M	S	S	S	S
CO 2	S	M	S	M	S
CO 3	S	S	S	M	S
CO 4	S	S	M	S	S
CO 5	S	S	S	S	S

S- Strong, M- Medium, L- Low

CORE ELECTIVE COURSE – II
PYTHON

Semester: IV **Max. Marks: 75**
Course Code: 22PMM4E2B **Credit: 04**
Total Periods: 90 **Exam Hours: 03**

Objective:

To acquire Object Oriented Skills in Python.

UNIT I

Introduction, what is Python, Origin, Comparison, Comments, Operators, Variables and Assignment, Numbers, Strings, Lists and Tuples, Dictionaries, if Statement, while Loop, for Loop, and the range () Built-in Function, Variable Assignment, Identifiers, Basic Style Guidelines, Memory Management, Python Application Examples.

UNIT II: Python Objects:

Python Objects, Standard Types, Other Built-in Types, Numbers and Strings. Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions. Sequences: Strings, Lists, and Tuples, Sequences, Strings, Strings and Operators, String-only Operators, Built-in Functions, String Built-in Methods, Special Features of String.

UNIT III

Interpolation: Lagrange Polynomial interpolation – Newton's polynomial interpolation – Root Finding: Bijection method – Newton Rapson Method.

UNIT IV

Ordinary Differential Equations: Initial value Problems – Boundary value Problems - Fourier Transforms: Fourier series.

UNIT V

Regression: Least square Regression - Eigenvalue and Eigenvectors

UNIT VI (Advanced topics only for discussion)

Current contours:

Discuss about topic in algebra, calculus and matrix analysis.

Text Book:

1. Mark Lutz, Learning Python, O'Reilly Media Inc, Fourth Edition, 2000

Reference Book:

1. Qingkai Kong, Timmy Siauw, Alexandre Bayen, Python Programming and Numerical Methods, Edition 1, 2020.
2. Joakim Sundnes, Introduction to Scientific Programming with Python, Simula Springer Briefs on Computing, Volume 6, 2020

Course Outcomes:

On the Successful completion of the course the students would be able to

CO Number	CO STATEMENT	KNOWLEDGE LEVEL
CO 1	Explain basic principles of Python programming language	K4
CO 2	Implement object-oriented concepts	K5
CO 3	Implement database and GUI applications	K5
CO 4	Ability to explore python especially the object-oriented concepts, and the built-in objects of Python.	K6
CO 5	To develop the ability to write database applications in Python	K5

Mapping with Programme Outcomes:

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO 1	S	S	M	S	S
CO 2	S	S	S	S	M
CO 3	M	S	S	S	S
CO 4	M	S	S	S	S
CO 5	S	M	S	M	S

S- Strong, M- Medium, L- Low