Sadakathullah Appa College

(Autonomous)

(Reaccredited by NAAC at an 'A' Grade. An ISO 9001:2015 Certified Institution)

Rahmath Nagar, Tirunelveli- 11.

Tamil Nadu

PG DEPARTMENT OF MATHEMATICS

CBCS SYLLABUS

For

M.Sc. MATHEMATICS

(Applicable for students admitted in June 2018 and onwards)

(As per the Resolutions of the Academic Council Meetings held on 03-03-2018 and 17-10-2018)

CONTENTS

COURSE STRUCTURE
POST GRADUATE DEPARTMENT OF MATHEMATICS
CBCS Syllabus – M.Sc., Mathematics (2018-19 onwards)

SEM	CO	TITLE OF THE PAPER	S.CODE	H/W	C	MARKS		
						I	E	T
I	DSC 1	Groups Rings & Fields	18PCMA11	6	4	25	75	100
	DSC 2	Real Analysis - I	18PCMA12	6	4	25	75	100
	DSC 3	Mathematical Statistics	18PCMA13	6	4	25	75	100
	DSC 4	Ordinary & Partial Differential Equations	18PCMA14	6	4	25	75	100
	DSE 1	A) Classical Mechanics	18PEMA1A	6	4	25	75	100
		B) Discrete Mathematics	18PEMA1B					
	Total			30	20			500
II	DSC 5	Linear Algebra	18PCMA21	6	4	25	75	100
	DSC 6	Real Analysis - II	18PCMA22	5	4	25	75	100
	DSC 7	LaTex and MATLAB	18PCMA23	6	4	25	75	100
	P-I	LaTex and MATLAB Practical	18PCMA2P	6	4	40	60	100
	DSE 2	A) Calculus of Variations and Integral Equation	18PEMA2A	4	4	25	75	100
		B) Numerical Analysis	18PEMA2B					
	IDC -I	Advanced Discrete Mathematics	18PIMA21	3	3	25	75	100
	Total			30	23			600
III	DSC 8	Graph Theory	18PCMA31	6	4	25	75	100
	DSC 9	Complex Analysis	18PCMA32	6	4	25	75	100
	DSC 10	Measure Theory and Integration	18PCMA33	6	4	25	75	100
	DSC 11	Operations Research	18PCMA34	5	4	25	75	100
	DSE 3	A) Differential Geometry	18PEMA3A	4	4	25	75	100
		B) Analytical Number Theory	18PEMA3B					
	IDC -II	Numerical and Statistical Method	18PIMA31	3	3	25	75	100
	Total			30	23			600
IV	DSC 12	Topology	18PCMA41	6	4	25	75	100
	DSC 13	Functional Analysis	18PCMA42	6	4	25	75	100
	DSC 14	Project	18PCMA43	8	8			100
	DSE 4	A) Programming in C++ and Data Structures	18PEMA4A	4	4	25	75	100
		B) Java Programming	18PEMA4B					
	P-II	A) Programming in C++ and Data Structures Practical	18PEMA4PA	6	4	40	60	100
		B) Java Programming Practical	18PEMA4PB					
	Total			30	24			500
			GRAND TOTAL	**120**	**90**			**2200**

CBCSSYLLABUS FOR M.Sc., MATHEMATICS

I SEMESTER			
DSC 1	**GROUPS, RINGS & FIELDS**		**18PCMA11**
Hrs / Week: 6	**Hrs / Sem: 90**	**Hrs / Unit:18**	**Credit: 4**

OBJECTIVES:

- To know the richness in the techniques of Mathematics by the way of studying class equation, Sylow's theorem, direct products and finite abelian Groups.
- To understand the in-depth concept of Euclidean Rings.
- To know that study of field theory plays a key role in algebra which has impact on the theory of equations.

UNIT I

A Counting Principle - Another Counting Principle - Sylow's Theorem (2^{nd} proof only)

UNIT II

Direct Products - Finite Abelian groups.

UNIT III

Euclidean Rings - A Particular Euclidean Ring - Polynomial Rings - Polynomials over the rational fields.

UNIT IV

Extension Fields – The Transcendence of e - Roots of Polynomials.

UNIT V

More About Roots – The Elements of Galois Theory (Fundamental Theorem of Galois theory statement only).

TEXT BOOK:

I.N. Herstein - Topics in Algebra (Second Edition) - Wiley India (P.)Ltd, New Delhi.

UNIT-I: Chapter 2(Section 2.5, 2.11, 2.12)

UNIT-II: Chapter 2(Section 2.13, 2.14)

UNIT-III: Chapter 3(Section 3.7 to 3.10)

UNIT-IV: Chapter 5(Section 5.1 to 5.3)

UNIT-V: Chapter 5(Section 5.5, 5.6)

I SEMESTER			
DSC 2	**REAL ANALYSIS – I**		**18PCMA12**
Hrs / Week: 6	**Hrs / Sem: 90**	**Hrs / Unit:18**	**Credit: 4**

OBJECTIVES:

- To enable the students to learn enough examples, theorems and techniques in analysis.
- To provide deep understanding of the Metric space concepts.
- To learn more about convergence, continuity and differentiation.

UNIT I

Basic topology: Finite, countable and uncountable sets – Metric spaces – compact sets – Perfect sets – Connected sets.

UNIT II

Numerical sequences and Series: Convergent sequences – Subsequences – Cauchy sequences – Upper and lower limits – Some special sequences.

UNIT III

Series – Series of Nonnegative terms – The number e – The Root and Ratio tests – Power series – Summation by parts – Absolute convergence – Addition and Multiplication of Series – Rearrangements.

UNIT IV

Continuity: Limits of functions – Continuous functions – Continuity and compactness – Continuity and connectedness – Discontinuities – Monotonic Functions – Infinite Limits and Limits at Infinity.

UNIT V

Differentiation: The Derivative of a Real Function – Mean Value Theorems – The Continuity of Derivatives – L' Hospital's Rule – Derivatives of Higher order – Taylor's Theorem – Differentiation of vector-valued functions.

TEXT BOOK:

Walter Rudin –"Principles of Mathematical Analysis" – 3rd Edition, McGraw Hill International Editions.

Unit I : Chapter 2(full)
Unit II : Chapter 3(section 3.1-3.20)
Unit III: Chapter 3(section 3.21-3.55)
Unit IV: Chapter 4(full)
Unit V: Chapter 5(full)

I SEMESTER			
DSC 3	**MATHEMATICAL STATISTICS**		**18PCMA13**
Hrs / Week: 6	**Hrs / Sem: 90**	**Hrs / Unit: 18**	**Credit: 4**

OBJECTIVES:

- To understand the concept of Probability and Probability Distributions.
- To learn the basic concepts of Mathematical Statistics.
- To know about the theory of sampling.

UNIT I

Conditional Probability and Stochastic Independence: Conditional Probability – Marginal and Conditional distributions – The correlation coefficient –Stochastic Independence

UNIT II

Some Special Distributions: The Binomial, Trinomial and Multinomial distributions –The Poisson distribution –The Gamma distribution & chi-square distribution –The normal distribution–The Bivariate normal distribution.

UNIT III

Distributions of functions of Random variables: Sampling Theory -Transformation of variables of the discrete type – Transformation of variables of the continuous type –The t and F Distributions.

UNIT IV

Extensions of the Change of variable Technique –Distribution of order statistics -The moment generating function technique -Distributions of $\bar{X}$and nS^2/σ^2 -Expectations of functions of random variables.

UNIT V

Limiting Distributions: Limiting Distributions –Stochastic convergence –Limiting moment generating functions –The central limit theorem –Some theorems on Limiting Distributions.

TEXT BOOK:

Robert V.Hogg and Allen T.Craig-Introduction to Mathematical Statistics-Pearson Education Asia, Chapters 2, 3, 4 and 5

Unit I: Chapter 2(section 2.1 to 2.4)

Unit II: Chapter 3(section 3.1 to 3.5)

Unit III: Chapter 4(section 4.1 to 4.4)

Unit IV: Chapter 4(section 4.5 to 4.9)

Unit V: Chapter 5(section 5.1 to 5.5)

I SEMESTER			
DSC 4	**ORDINARYAND PARTIAL DIFFERENTIAL EQUATIONS**		**18PCMA14**
Hrs / Week: 6	**Hrs / Sem: 90**	**Hrs / Unit: 18**	**Credit: 4**

OBJECTIVES:

- To discuss several methods for finding power series solutions to differential equations of first order and second order.
- To understand the difference between ordinary and regular singular points.
- To learn more about the concepts of first order partial differential equations.

UNIT I

Introduction: A review of power series - Series solutions of first order equations - Second Order Linear equations and Ordinary points

UNIT II

Regular singular points - Regular singular point (continued) - Gauss Hyper Geometric equation - Point at infinity.

UNIT III

Legendre Polynomials- Properties of Legendre Polynomials - Bessel functions. The Gamma Function- Properties of Bessel Functions

UNIT IV

Partial Differential Equations - Origin 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.

UNIT V

Cauchy's method of characteristics - Compatible systemsoffirst order equations - Charpit's method - Special type of first order equations- Solution satisfying the given conditions - Jacobi's Method

TEXT BOOK:

1. **G.F. Simmons**- Differential equation with application and historical notes – TataMcGraw Hill Publishing Company Ltd, New Delhi.
   UNIT I: Section 25 to 27
   UNIT II: Section 28 to 31
   UNIT III: Section 32 to 35
2. Ian N. Sneddon – Elements of Partial Differential Equations – Dover Publications, Inc-Mineola, New York.

UNIT IV: Chapter 2 (Section 1 to 6)
UNIT V: Chapter 2 (Section 8 to 13)

I SEMESTER			
DSE 1(A)	**CLASSICAL MECHANICS**		**18PEMA1A**
Hrs / Week: 6	**Hrs / Sem: 90**	**Hrs / Unit: 18**	**Credit: 4**

OBJECTIVES:

- To learn more about of the mechanics of a partical, Lagrange's equations.
- To study the concepts and advantages of Hamilton's principle.
- To learn about Central force problems, Kepler's problem.

UNIT I

Survey of the Elementary Principles: Mechanics of a particle - Mechanics of a system of particles – Constraints - D'Alembert's principle and Lagrange's Equations.

UNIT II

Velocity-dependent potentials and the dissipation functions - Simple applications of the Lagrangian formulation - single particle in space (Cartesian co-ordinates,plane polar co-ordinates)-Atwood's machine-bead sliding on rotating wire.

UNIT III

Variational Principles and Lagrange's Equations: Hamilton's principle - Some techniques of the calculus of variations - Derivation of Lagrange's equations from Hamilton's principle - Extension of Hamilton's principle to nonholonomic systems - Advantages of a variational principle formulation – Conservation theorems and symmetry properties.

UNIT IV

The Two-Body Central Force Problem: Reduction to the equivalent one-body problem - The equations of motion and first integrals - The equivalent one-dimensional problem, and classification of orbits – The virial theorem – The differential equation for the orbit, and integrable power-law potentials.

UNIT V

Conditions for closed orbits (Bertrand's theorem) - The Kepler problem: Inverse Square law of force -The motion in time in the Kepler problem - The Laplace-Runge-Lenz vector-scattering in a central force field.

TEXT BOOK:

Herbert Goldstein- Classical Mechanics-Second Edition-Narosa Publishing House Pvt.Ltd

Unit I: Chapters 1 (Section 1.1 to 1.4)
Unit II: Chapters 1 (Section 1.5 to 1.6)
Unit III: Chapters 2 (Section 2.1 to 2.6)
Unit VI: Chapters 3 (Section 3.1 to 3.5)
Unit V: Chapters 3 (Section 3.6 to 3.10)

I SEMESTER			
DSE 1 (B)	**DISCRETE MATHEMATICS**		**18PEMA1B**
Hrs / Week: 6	**Hrs / Sem: 90**	**Hrs / Unit: 18**	**Credit: 4**

OBJECTIVES:

- To study the basic concepts of Propositional Logic, Predicates and quantifiers
- To study on Pigeon Hole Principle, Permutation and combination.
- To learn about Boolean Functions, Logic Gates and Minimization.

Unit I:

Propositional Logic – Propositional equivalence - Predicates and quantifiers.

Unit II:

The Basics of counting – The Pigeonhole principle – Generalized permutation and combination.

Unit III:

Relation and their properties – n-ary relations and their applications – representing relation – closures of relations.

Unit IV:

Boolean functions – Representing Boolean functions.

Unit V:

Logic Gates –Minimization.

TEXT BOOK:

Discrete Mathematics and its Applications (Sixth Edition) – Kenneth H. Rosen. WCB/ McGraw Hill Publications

Unit I: Sections: 1.1 - 1.3.

Problems: Section 1.1(1 - 38), Section 1.2(1 - 35) and Section 1.3(1 – 34)

Unit II: Sections: 5.1, 5.2 and 5.5

Problems: Section 5.1(1 - 40), Section 5.2(1 - 22) and Section 5.5(1 – 9)

Unit III: Sections: 7.1 – 7.4 except Warshal's algorithm

Problems: Section 7.1(All exercise problems),

Section 7.2(1 - 27), Section 7.3(1 – 22)

and Section 7.4(1 – 22)

Unit IV: Sections: 10.1 and 10.2

Unit V: Sections: 10.3 and 10.4

II SEMESTER			
DSC 5	**LINEAR ALGEBRA**		**18PCMA21**
Hrs / Week: 6	**Hrs / Sem: 90**	**Hrs / Unit:18**	**Credit:4**

OBJECTIVES:

- To study the basic concepts of linear dependence, basis, homomorphisms of vector spaces and Inner product spaces.
- To understand an extremely rich structure called algebra of linear transformations and the canonical forms.
- To learn about Trace, Transpose and determinants.

UNIT I

Elementary Basic Concepts of Vector Spaces - Linear Independence and Bases - Dual Spaces.

UNIT II

Inner Product Spaces - Modules.

UNIT III

The Algebra of Linear Transformations - Characteristic roots - Matrices.

UNIT IV

Canonical Forms: Triangular form - Nilpotent Transformations.

UNIT V

Determinants - Hermitian, Unitary and Normal Transformations.

TEXT BOOK:

I.N. Herstein - Topics in Algebra (Second Edition) - Wiley India (P.) Ltd, New Delhi

UNIT I: Chapter 4 (Section 4.1 to 4.3)
UNIT II: Chapter 4 (Section 4.4 to 4.5)
UNIT III: Chapter 6 (Section 6.1 to 6.3)
UNIT IV: Chapter 6 (Section 6.4, 6.5)
UNIT V: Chapter 6 (Section 6.9 , 6.10)

II SEMESTER			
DSC 6	**REAL ANALYSIS II**		**18PCMA22**
Hrs / Week: 5	**Hrs / Sem: 75**	**Hrs / Unit:15**	**Credit:4**

OBJECTIVES:

- To enable the students to learn enough examples, theorems and techniques in analysis.
- To learn about Riemann integration, Sequence and series of functions and Equicontinuous families of functions.
- To impart a deep knowledge in some special functions and functions of several variables.

UNIT I

The Riemann–StieltjesIntegral: Definition and Existence of the Integral – Properties of the Integral – Integration and differentiation.

UNIT II

Sequences and Series of Functions: Discussion of main problem – Uniform convergence – Uniform convergence and continuity – Uniform convergence and Integration.

UNIT III

Uniform convergence and Differentiation - Equicontinuous Families of functions.

UNIT IV

Some Special Functions: Power Series – The Exponential and Logarithmic Functions – The Trigonometric Functions – The Algebraic Completeness of the Complex Field – Fourier Series

UNIT V

Functions of Several Variables: Differentiation – The Contraction principle – The Inverse Function Theorem – The Implicit function theorem.

TEXT BOOKS:

Walter Rudin – Principles of Mathematical Analysis, (3rd Edition), Mc Graw Hill International Editions.

UNIT I : Chapter 6(section6.1 _ 6.22)

UNIT II : Chapter 7(section 7.1 – 7.16)

UNIT III : Chapter 7(section 7.17 – 7.25)

UNIT IV : Chapter 8(section 8.1 _ 8.12)

UNIT V : Chapter 9(Section 9.10 - 9.29)

II SEMESTER		
DSC 7	**LATEX AND MATLAB**	**18PCMA23**
Hrs / Week: 6	**Hrs / Sem: 6 x 15 = 90 Hrs / Unit: 18**	**Credit: 4**

OBJECTIVES

- To learn the latest techniques in Latex for the preparation of printable document in an enhanced manner.
- To avoid difficulty while typing project or thesis comparing other mathematical software.
- To solve mathematical equations and to draw graphs using MATLAB.

UNIT – I

Introduction - Basics of a Latex file- **Text, Symbols and Commands:**Command names and arguments – Environments– Declarations – Lengths – Special characters - **Document Layout and Organization:** Document class - Page style - Parts of the document - Table of contents -**Displayed Text:** Changing font style – Centering and indenting – Lists – Generalized lists Theorem like-declarations -**Text in Boxes:**Boxes - Footnotes and marginal notes.

UNIT – II

Tables: Tabular stops – Tables - **Mathematical Formulas**: Mathematical Environment – Main elements of math mode – Mathematical symbols - Additional Elements - Fine tuning mathematics - **Drawing with Latex:** The picture environment – Extended pictures.

UNIT - III

Introduction- What is the Basics of MATLAB - Matrices and Vectors - Matrix and array operations.

UNIT IV

Interactive computation: Character strings – A special note on array operations – Command Line Function - Using built in functions and Online help – Saving and Loading data - Plotting simple graphs.

UNIT V

Application: Linear Algebra – Curve Fitting and Interpolation –Data Analysis and Statistics – Numerical Integration– **Ordinary Differential Equation:** A first order linear ODE and A second order non-linear ODE.

TEXT BOOKS:

1. Guide to LATEXby **Helmut Kopka** and **Patrick W.Daly**, Fourth Edition, Addison – Wesley, Pearson Education, 2004.

UNIT I: Chapter 1: Sections: 1.5, 2.1 – 2.5, 3.1 – 3.4, 4.1 – 4.5, 5.1-5.2

UNIT II: Chapter 2: Sections: 6.1 – 6.2, 7.1 – 7.5, 16.1 –16.2.

2. Getting Started with MATLAB – A quick introduction for Scientist and Engineers by RudraPratap, Oxford University Press 2003.

UNIT III: Chapter 3: Sections: 1.1, 1.6, 3.1, 3.2

UNIT IV: Chapter 4: Sections: 3.3 – 3.8.

UNIT V: Chapter 5: Sections: 5.1 – 5.4, 5.5 (5.5.1,5.5.2 only).

II SEMESTER		
P-I	**LATEX AND MATLAB**	**18PCMA2P1**
Hrs / Week: 6	**Hrs / Sem: 90**	**Credit: 4**

LATEX PRACTICAL

1. Write a LaTex coding for Simple LaTex program.
2. Write a LaTeX coding for Basic Mathematical Equation.
3. Write a LaTeX coding for Mathematical Equation with Mathematics Formulae.
4. Write a LaTex coding for Mathematical Equation with Delimiters.
5. Write a LaTeX coding for Chess Board.
6. Write a LaTeX coding for Rangoli.
7. Write a LaTex coding for Lotus.
8. Write a LaTeX coding for Natural Scene with Home.
9. Write a LaTeX coding for Tamil letters.
10. Write a LaTeX coding foryour name in Colour& Tamilletters.
11. Write a LaTeX coding for Different types of Graphs in Graph Theory
12. Write a LaTeX coding for Time Table.
13. Write a LaTeX coding for Class Schedule Time Table.
14. Write a LaTeX coding for Draw different types of Boxes.
15. Write a LaTeX coding for Preparing a paper in Journal.
16. Write a LaTeX coding for Beemer presentation with lists.

MATLAB PRACTICAL

1. To find the addition, subtraction and multiplication of any two matrix using MATLAB coding.
2. To find the determinant, inverse and Eigen value of given matrix using MATLAB coding.
3. To delete and display the rows and columns of a Matrix using MATLAB coding.
4. To solve a linear system of three equations using MATLAB coding.
5. Create a Simple inline function and Anonymous function and compute its value using MATLAB coding.
6. To find the roots of the polynomial using MATLAB coding.
7. To draw a line using MATLAB coding.
8. To draw a curve using MATLAB coding.
9. To plot the various graphs using MATLAB coding.
10. To solve the partial fraction using MATLAB coding.

II SEMESTER		
DSE 2(A)	**CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS**	**18PEMA2A**
Hrs / Week: 4	**Hrs / Sem: 60 Hrs / Unit:12**	**Credit: 4**

OBJECTIVES:

- To know the relation between differential and integral equations, and how to change from one to another.
- To study the basic concepts of maxima and minima in Calculus of Variations with its applications.
- To understand the relation between differential and integral equations and to study the concept of Green's function.
- To learn about Fred-holm equations and Hilbert Schmidt theory.

UNIT I

Calculus of Variations and Applications: Maxima and minima - The simplest case - Illustrative examples - Natural boundary conditions and transition conditions.

UNIT II

Constraints and Lagrange multipliers - Variable end points - Sturm-Liouville problems - Lagrange's equations.

UNIT III

Integral Equations: Introduction - Relation between differential and integral equations - The Green's function.

UNIT IV

Fredholm equations with separable kernels - Illustrative example.

UNIT V

Iterative methods for solving equations of the second kind - Fredholm theory

TEXT BOOK:

Francis B.Hildebrand, Methods of Applied Mathematics**,** Second Edition, Prentice Hall, INC. Englewood Cliffs, New Jersey

UNIT I: Chapter 2 (Section 2.1 to 2.4)

UNIT II: Chapter 2 (Section 2.7 to 2.9 &2.11)

UNIT III: Chapter 3 (Section 3.1 to 3.3)

UNIT IV: Chapter 3 (Section 3.6 & 3.7)

UNIT V: Chapter 3 (Section 3.9 & 3.11)

II SEMESTER		
DSE 2(B)	**NUMERICAL ANALYSIS**	**18PEMA2B**
Hrs / Week: 4	**Hrs / Sem: 60 Hrs / Unit:12**	**Credit: 4**

OBJECTIVES:

- To study the basic concepts of maxima and minima in Calculus of Variations with its applications.
- To understand the relation between differential and integral equations and to study the concept of Green's function.
- To learn about Fredholm equations and Hilbert Schmidt theory.

Unit I:

Interpolation: Newton's Interpolation Formula – Lagrange's Interpolation formula – Divided differences - Newton's Divided differences formula – Inverse Interpolation

Unit II:

Numerical differentiation – Derivatives using Newton's forward, backward, difference formulae

Unit III:

Numerical Integration –Gaussian Quadrature formula –Numerical evaluation of double integrals

Unit IV:

Numerical solutions of ordinary differential equations – Taylor's series Method – Euler's Method – RungeKutta Method.

Unit V:

Predictor corrector Method – Milnes Method – Adams-Bashforth Method.

TEXT BOOK:

Numerical Methods, S. Arumugam and others, Scikech (2001)

Unit I: Chapter 7(Sections 7.1 to 7.3)

Unit II: Chapter 8 (Sections 8.1 to 8.3)

Unit III: Chapter 8 (Sections 8.5 to 8.7)

Unit IV: Chapter 10 (Sections 10.1,10.3 , 10.4)

UnitV: Chapter 10 (Sections 10.5 to 10.7)

III SEMESTER			
DSC 8	**GRAPH THEORY**		**18PCMA31**
Hrs / Week: 6	**Hrs / Sem: 90**	**Hrs / Unit: 18**	**Credit: 4**

OBJECTIVES:

- To provide an in-depth knowledge of graph theoretical concepts.
- To motivate the students to do research in discrete and applied mathematics.
- To learn about coloring and Ramsey numbers.

UNIT I

Trees: Bridges - Trees. Connectivity: Cut vertices - Blocks – Connectivity.

UNIT II

Traversability: Eulerian graphs–Hamiltonian graphs. Digraphs: Strong Digraphs.

UNIT III

Matchings and Factorizations: Matchings – Factorization – Decompositions and Graceful Labelings.

UNIT IV

Planarity: Planar graphs –Embedding Graphs on surfaces. Coloring: Vertex coloring.

UNIT V

Edge coloring –The Heawood Map coloring theorem.Ramsey Numbers: The Ramsey number of graphs. Distance: The centre of a graph.

TEXT BOOK:

Gary Chartrand and Ping Zhang - Introduction to Graph Theory, Edition 2006. Tata McGraw-Hill Publishing Company Limited, New Delhi.

UNIT I: Chapter 4(4.1, 4.2), Chapter 5(5.1, 5.2, 5.3).

UNIT II: Chapter 6(6.1, 6.2), Chapter 7(7.1).

UNIT III: Chapter 8(8.1, 8.2, 8.3)

UNIT IV: Chapter 9(9.1, 9.2), Chapter 10 (10.2).

UNITV: Chapter 10 (10.3, 10.4), Chapter 11(11.1), Chapter 12 (12.1).

III SEMESTER			
DSC 9	**COMPLEX ANALYSIS**		**18PCMA32**
Hrs / Week: 6	**Hrs / Sem: 90**	**Hrs / Unit: 18**	**Credit: 4**

OBJECTIVES:

- To learn the basic concepts of analytic functions and power series.
- To understand the concepts of Complex Integration using and Cauchy's integral formula and Residue theorem
- To acquire the knowledge of Harmonic functions.

UNIT I

Complex Functions: Introduction to the Concept of Analytic Function - Elementary Theory of Power Series

UNIT II

Conformality: Arcs and closed curves - Analytic functions in Regions-Conformal Mapping - Length and Area. **Linear Transformations:** The Linear Group - The cross ratio - Symmetry.

UNIT III

Complex Integration: Fundamental Theorems - Cauchy's Integral Formula.

UNIT IV

Local Properties of Analytical Functions: Removable Singularities and Taylor's Theorem – Zeros and Poles - The Local Mapping - **The Calculus of Residues**.

UNIT V

Harmonic Functions: Definition and Basic Properties –The Mean-value Property – Poisson's Formula – Schwarz's Theorem - Power Series expansions.

TEXT BOOKS:

Lars V. Ahlfors -Complex Analysis - Third Edition - McGraw- Hill International Company, Singapore.

UNIT I: Chapter 2(1.1 to 1.4 and 2.1 to 2.5)
UNIT II: Chapter 3(2.1 to 2.4 and 3.1 to 3.3)
UNIT III: Chapter 4(1.1 to 1.5 and 2.1 to 2.3)
UNIT IV: Chapter 4(3.1 to 3.3and 5.1 to 5.3)
UNIT V: Chapter4(6.1 to 6.4) Chapter 6 (1.1 to 1.3)

III SEMESTER		
DSC 10	**MEASURE THEORY AND INTEGRATION**	**18PCMA33**
Hrs / Week: 6	**Hrs / Sem: 90 Hrs / Unit: 18**	**Credit: 4**

OBJECTIVES:

- To Introduce the Lebesgue Measure and Lebesgue Integrals, Measure and Integration.
- To understand the concept of measurable functions & some basic theorems on measurable functions
- To learn about measure spaces, signed measures and product measures.

UNIT I

Lebesgue Measure: Introduction - Outer Measure - Measurable Sets and Lebesgue Measure –A non Measurable set - Measurable Functions - LittleWood's three principles.

UNIT II

The Lebesgue Integral: Riemann Integral - The Lebesgue Integral of a bounded function over a set of finite measure - The Integral of a non negative function - The general Lebesgue Integral - Convergence in Measure.

UNIT III

Differentiation and Integration: Differentiation of monotone functions - Functions of bounded variation - Differentiation of an integral - Absolute continuity.

UNIT IV

Measure and Integration: Measure Spaces - Measurable functions-Integration - General convergence Theorems - Signed Measures - The Radon Nikodym Theorem.

UNIT V

Measure and Outer Measure: Outer Measure and Measurability - The Extension Theorem - Product Measures - Integral Operators.

TEXT BOOKS:

H.L.Royden-Real Analysis, Dorling Kindersley (India) Pvt. Ltd - Third Edition, Pearson Education.

Unit I: Chapter 3(1 to 6)

Unit II: Chapter 4(1 to 5)

Unit III: Chapter 5(1 to 4)

Unit IV: Chapter 11(1 to 6)

Unit V: Chapter 12(1, 2, 4 and 5)

III SEMESTER		
DSC 11	**OPERATIONS RESEARCH**	**18PCMA34**
Hrs / Week: 5	**Hrs / Sem: 75 Hrs / Unit: 15**	**Credit: 4**

OBJECTIVES:

- To understand the concept of dynamic programming, game theory and decision theory.
- To understand basic techniques for effective decisions–making.
- To understand the concept of Queuing theory and develop linear programs from standard business problems
- To provide a formal quantitative approach to problem solving and an intuition about situations where such an approach is appropriate.

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UNIT I

Introduction to Linear Programming: Graphical LP Solution – Graphical Sensitivity Analysis – Computer Solution of LP Problems.

UNIT II

The Simplex Method: LP Solution space in Equation form – Simplex Iterations with TORA – Artificial starting solution. Simplex Method Application – Degeneracy.

UNIT III

Decision Analysis: Decision making under risk – Decision making under uncertainty.

UNIT IV

Network Models: Network Representation – critical path (CPM) Computations – Construction of theTime Schedule – Linear Programming Formulation of CPM – PERT Networks.

UNITV

Queuing theory: Elements of Queuing Model – Role of Exponential distribution - single and Multi-Server Models.

Theory: Problem = 60: 40

TEXT BOOK:

1. **HAMDY A. TAHA**, Operations Research An Introduction, 7th Edition, MacMillan Publishing Company, New York.

2. **KantiSwarup, P.K. Gupta and Man Mohan**, Operation Research, Eleventh Edition, Sultan Chand & Sons, New Delhi.

UNIT I: Chapter 2 (Section 2.2,2.3)
UNIT II:Chapter 3 (Section3.1,3.3.3,3.4,3.5)
UNIT III: Chapter 14 (Section 14.2,14.3)
UNIT VI: Chapter 6 (Section6.6.1 – 6.6.5)
UNIT V: Chapter 17 (Section17.2,17.3,17.6.1- 17.6.4)

III SEMESTER		
DSE 3(A)	**DIFFERENTIAL GEOMETRY**	**18PEMA3A**
Hrs / Week: 4	**Hrs / Sem: 60 Hrs / Unit: 12**	**Credit: 4**

OBJECTIVES:

- To introduce the basic concepts in three dimensional Euclidean space.
- To introduce the essential ideas and method of differential geometry.
- To learn about the Geodesics, Canonical geodesics, geodesic curvature.

UNIT I

The theory of space curves – Definitions, Arc length – Tangent – Normal and Binormal - Curvature and Torsion.

UNIT II

Contact between curves and surfaces – Tangent Surface – Involutes and evolutes.

UNIT III

Definition of a surface – Curves on a surface – Helicoids.

UNIT IV

Metric – Direction Coefficients - Families of curves - Geodesics.

UNIT V

Canonical geodesic equation, Normal Property of geodesics (Christoffel symbols not included). Geodesic curvature,

TEXT BOOKS:

T.J.Willmore - An Introduction to Differential Geometry, Oxford University Press, (17th Impresssion), New Delhi, 2002, (Indian Print)

.

Unit I: Chapter 1: Section: 1.1 – 1.4. problem:chapter1:1-4

Unit II:Chapter 1: Section: 1.5- 1.7 and.problem:chapter1:8-12

Unit III:Chapter 2: Section: 2.1, 2.2, 2.4,.problem: chapter 2:1-4

Unit IV:Chapter 2: Section: 2.5-2.7.problem: chapter 2:6-8

Unit V:Chapter 2: Section: 2.10-2.12,2.15.problem: chapter 2:10-12

III SEMESTER		
DSE 3(B)	**ANALYTICAL NUMBER THEORY**	**18PEMA3B**
Hrs / Week: 4	**Hrs / Sem: 60 Hrs / Unit: 12**	**Credit: 4**

OBJECTIVES:

- To introduce the fundamental theorem of arithmetic.
- To have a deep knowledge in Analytical Number Theory.
- To learn about congruences and linear congruences.

UNIT I:

The Fundamental Theorem of Arthmetic: Introduction – Divisibility- Greatest Common Divisor – Prime Numbers - Fundamental Theorem of Arthmetic – The series of reciprocals of the Primes

UNIT II:

The Fundamental Theorem of Arthmetic: The Euclidean Algorithm – The greatest common divisor of more than two numbers. Arithmetical Function and Dirichlet multiplication: Introduction – The Mobious Function $\mu(n)$ – The Euler Totient Function $\varphi(n)$ – A relation connecting φ and μ - A product formula for $\varphi(n)$ – The Dirichlet Product of arithmetic functions –Dirichlet inverses and Mobius inversion formula –The Mangoldt function $\Lambda(n)$.

UNIT III:

Arithmetical Function and Dirichlet multiplication: Multiplicative functions – Multiplicative functions and Dirichlet multiplication –The inverse of a completely multiplicative functions –Liouvil e's function $\lambda(n)$ –The divisor functions $\sigma_\alpha(n)$ – Generalized convolutions. **Averages of Arithmetical Functions:** Introduction –The big oh notation. Asymptotic equality of functions –Euler's summation formula –Some Elementary asymptotic formulas.

UNIT IV:

Averages of Arithmetical Functions: The average order of d(n)–The average order of the divisor functions $\sigma_\alpha(n)$ –The average order of $\varphi(n)$ –An application to the distribution of lattice points visible from orgin –The average order of $\mu(n)$ and of $\Lambda(n)$. The partial sum of a Dirichlet product- Applications to $\mu(n)$ and $\Lambda(n)$- Another identity for the partial sums of a Dirichlet product.

UNIT V:

Some Elementary Theorems on the distribution of Prime Numbers: Introduction – Chebyshev's function $\Psi(n)$ and $\upsilon(n)$ –Relations connecting $\upsilon(x)$ and $\pi(x)$ –Some equivalent forms of the prime number theorem –Inequalities for $\pi(n)$ and p_n–Shapiro's Tauberian theorem.

TEXT BOOKS:

Tom M.Apostol- Introduction to analytical number theory
Unit I: Chapter 1 (Section 1.1-1.6)
Unit II: Chapter 1 (Sections 1.7 & 1.8) and Chapter 2 (Section2.1 - 2.8)
Unit III: Chapter 2 (Section (2.9 – 2.14) andChapter 3 (Section 3.1 – 3.4)
Unit IV: Chapter 3 (Section3.5 -3.12)
Unit V: Chapter 4 (Section4.1 -4.6)

IV SEMESTER			
DSC 12	**TOPOLOGY**		**18PCMA41**
Hrs / Week: 6	**Hrs / Sem: 90**	**Hrs / Unit: 18**	**Credit:4**

OBJECTIVES:

- To introduce basic concepts of Topology.
- To introduce product Topology and quotient Topology.
- To study the countability axioms and Urysohnmetrization theorem.

UNIT I

Topological spaces – Basis for a Topology – Order Topology – The product Topology on X ×Y – The Subspace Topology – Closed sets and Limit points.

UNIT II

Continuous functions – The Product Topology - The Quotient Topology.

UNIT III

Connected spaces, components and local connectedness - compact spaces.

UNIT IV

Local compactness - TheCountability axioms - The Separation axioms.

UNIT V

Normal Spaces – Urysohn lemma –Urysohnmetrization theorem.(first version of proof only).

TEXT BOOKS:

J.R. Munkres–Topology-2nd Edition, Eastern Economy Edition – Prentice- Hall of Indi Pvt Ltd, New Delhi.

UNIT I: Chapter 2 (12 to 17).
UNIT II: Chapter 2(18, 19, 22).
UNIT III: Chapter 3 (23, 25, 26).
UNIT IV: Chapter 3 (29), Chapter 4 (30, 31).
UNIT V: Chapter 4 (32, 33, 34)

IV SEMESTER			
DSC 13	**FUNCTIONAL ANALYSIS**		**18PCMA42**
Hrs / Week: 6	**Hrs /Sem: 90**	**Hrs / Unit: 18**	**Credit: 4**

OBJECTIVES:

- To introduce the study of Banach spaces and its applications.
- To introduce the concept of Hilbert spaces, conjugate spaces, adjoint, selfadjoint, normal and unitary operators.
- To introduce finite dimensional spectral theory.

UNIT I

Banach Spaces: The definition and some examples - Continuous linear transformations -The Hahn-Banach theorem.

UNIT II

The natural imbedding of N in N** - The open mapping theorem - The conjugate of an operator.

UNIT III

Hilbert spaces: The definition and some simple properties - Orthogonal complements -Orthonormal sets - The conjugate space H*.

UNIT IV

The adjoint of an operator – Self-adjoint operator - Normal and Unitary operators - Projections.

UNIT V

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

TEXT BOOK:

George F.Simmons – Introduction to Topology and Modern Analysis, Tata McGraw-Hill Publishing Company Ltd, New Delhi.

UNIT I: Chapter 9(46 to 48)
UNIT II: Chapter 9(49 to 51)
UNIT III: Chapter 10(52 to 55)
UNIT IV: Chapter 10(56 to 59)
UNIT V: Chapter 11(60 to 62)

IV SEMESTER		
DSC 14	**PROJECT**	**18PCMA43**
Hrs / Week: 8	**Hrs / Sem: 120**	**Credit: 8**

OBJECTIVE:

To make students prepare the project on recent development and research in mathematics based on the guidelines.

The following are the guidelines to be adhered to

- The project should be an individual one
- The language for the project is **English**
- The Minimum number of pages should be **60**
- Project observations, suggestions and conclusion shall be formed as part of the project.
- The Projects will be evaluated both by the Internal as well as External Examiner each for 100 marks. The distribution of mark should be 60 marks for the Project Report and 40 marks for the Viva-voce Examination. The Division of marks for the Project Report is as mentioned below:

Particulars	Internal Examiner	External Examiner
Wording of Title	5	5
Objectives/ Formulation including Hypothesis	5	5
Review of Literature	10	10
Relevance of Project to Social Needs	5	5
Methodology/ Technique/ Procedure Adopted	20	20
Summary/ Findings/ Conclusion	5	5
Bibliography/ Annexure/ Foot notes	10	10
Total	**60**	**60**

The average mark of Internal and External Examiner is considered as marks of project report.

IV SEMESTER		
DSE 4(A)	**Programming in C++ and Data Structures**	**18PEMA4A**
Hrs / Week: 4	**Hrs / Sem: 60 Hrs / Unit: 12**	**Credit: 4**

OBJECTIVES:

- To study the C++ language as it plays an important role in the software area.
- To enable the students to face this competitive world by learning the various techniques in developing a program.
- To understand data structure- stacks, queues and graphs.

UNIT I

Control Structures – Functions in C++ – Classes and objects.

UNIT II

Operator Overloading and Type Conversion – Inheritance: Extending Classes.

UNIT III

Pointers, Virtual functions and polymorphism - Managing Console I/O operations.

UNIT IV

Stacks and Queues - Singly Linked list - Linked stacks and Queues – Polynomial Addition.

UNIT V

Graphs – Internal Sorting.

TEXT BOOK

1. **E. Balagurusamy**- Object oriented programming in C++, 4th Edition, TataMcGraw – Hill publishing company Limited.
UNIT I: Chapter 3(Section-3.24),Chapter 4(Section-4.1 – 4.11),
Chapter 5 (Section-5.1 – 5.16)
UNIT II:Chapter 7(Section 7.1 – 7.8),Chapter 8(Section -8.1 – 8.12)
UNIT III: Chapter 9(Section -9.1 – 9.7), Chapter 10 (Section -10.1 – 10.6)

2. **Ellis Horowitz &SartajSahni** – Fundamental's of Data Structures, Galgotia books source, Gurgaon.
UNIT IV: Chapter 3 (Section 3.1 – 3.4), Chapter 4 (Section 4.1,4.2,4.4)
UNIT V: Chapter 6 (Section 6.1 - 6.5), Chapter 7 (Section 7.1 - 7.6)

IV SEMESTER			
DSE 4(B)	**JAVA PROGRAMMING**		**18PEMA4B**
Hrs / Week: 4	**Hrs / Sem: 60**	**Hrs / Unit: 12**	**Credit: 4**

Objectives:

- To have a knowledge of JAVA Language.
- To study Classes, Objects and Methods.
- To study how to develop algorithms and to provide a deep understanding in the field of computer programming.

UNIT I

An Overview of Java Language: Object oriented programming–A first simple program–A second short program–Two control statements –Using blocks of code –Lexical issues–The java class libraries. **Data types, variables & Arrays**: The primitive types–Integers–Floating-point types –Characters–Booleans–A closer look at Literals –Variables –Type conversion and casting–Arrays. **Operators**: Arithmetic Operators–The Bitwise Operators–Relational Operators –Boolean Logical Operators–The Assignment Operator–The ? Operator–Operator precedence –Using parentheses.

UNIT II

Control statements: Java's selection statements–Iteration statements–Jump statements. **Introducing Classes**: Class fundamentals – Declaring objects – Assigning object Reference Variables – Introducing methods – Constructors – The this keyword – Garbage collection – The finalize ( ) method. **A closer look at methods & classes**: Over loading methods – using objects as parameters – A closer look at argument passing – returning objects – Recursion – Introducing Access control – Understanding static – Introducing final – Introducing Nested & inner classes.

UNIT III

Inheritance: Inheritance Basics – using super – creating a multilevel hierarchy – when constructors are called – method overriding – Dynamic method dispatch – using abstract classes – using final with inheritance – The object class. **Packages and Interfaces:** Packages - Access protection – importing packages – Interfaces.

UNIT IV

Exception handling: Exception handling fundamentals – Exception types – Uncaught Exceptions – Using try and catch- Multiple catch clauses – Nested try statements – throw – throws – finally. **Multithreaded Programming:** The java thread model – The main thread – Creating a thread – creating multiple threads – using is Alive () and join () – thread priorities.

UNIT V

The Applet class: Two types of Applets – Applet basics – Applet architecture – An Applet skeleton – simple Applet display methods – requesting repainting – using the status window – The HTML Applet tag – passing parameters to Applets. **Introducing the AWT: Working with windows, graphics & Text:** AWT classes – window fundamentals – working with frame windows –creating a frame window in an Applet – creating a windowed program – displaying information within a window – working with graphics – working with color.

TEXT BOOKS:

Herbert Schildt-JAVA – 2, The Complete reference (7th edition), Tata McGraw Hill 2001.
Unit I: Chapter 2(full), 3(2 to 9,11),4(full)
Unit II: Chapter 5(full),6(1 to 8),7(1 to 8,10)
Unit III: Chapter 8(full),9(full)
Unit IV: Chapter 10(1-9),11(1-6)
Unit V: Chapter 21(1 to 9),23(1-8)

V SEMESTER		
P-II	**PROGRAMMING IN C++ and DATA STRUCTURES**	**18PEMA4PA**
Hrs/Week: 6	**Hrs / Sem: 90**	**Credit: 4**

PROGRAMMING IN C++ PRACTICAL

3.24) Write a Program to evaluate the following investment equation
$V = P(1 + r)^n$ and print the tables which would give the value of V for various combination of the following values of P, r, and n:
P: 1000, 2000, 3000, ..., 10,000
r: 0.10, 0.11, 0.12,..... 0.20
n: 1, 2, 3, ..., 10
(Hint: P is the principal amount and V is the value of money at the end of n years. This equation can be recursively written as
$V = P(1 + r)$
$P = V$
In other words, the value of money at the end of the first year becomes the principal amount for the next year, and so on.

3.25 **)**An election is contested by five candidates. The candidates are number 1 to 5 and the voting is done by marking the candidate number on the ballot paper. Write a program to read the ballots and count the votes cast for each candidates using an array variable count. In case, a number read is outside the range 1 to 5, the balot should be considered as a 'spoilt balot', and the program should also count the number of spoilt ballots.

3.27**)**Write programs to evaluate the following functions to 0.0001% accuracy.

a) $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} + \frac{x^7}{7!} + ...$

b) $SUM = 1 + |(1/2)^2 + (1/3)^3 + (1/4)^4 + ...$

c) $\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} + \frac{x^6}{6!} + ...$

3.30**)** An electricity board charges the following rates to domestic users to discourage large consumption of energy:

For the first 100 units	-	60 P per unit
For next 200 units	-	80 P per unit
Beyond 300 units	-	90 P per unit

All users are charged a minimum of Rs. 50.00. If the total amount is more than Rs. 300.00 then an additional surcharge of 15% is added.
Write a program to read the names of users and number of units consumed and print out the charges with names.

4.19**)** Write a function *power ( )* to raise a number *m* to a power *n*. The function takes a *double* value for *m* and int value for n and returns the result correctly. Use a default value to 2 for n to make the function to calculate squares when this argument is omitted. Write a main that gets the values of m and n from the user to test the function.

5.11) Define a class to represent a bank account. Include the following members.
Data members

1. Name of the depositor
2. Account number

3. Type of account
4. Balance amount in the account

Member functions

1. To assign initial values
2. To deposit an amount
3. To withdraw an amount after checking the balance
4. To display name and balance

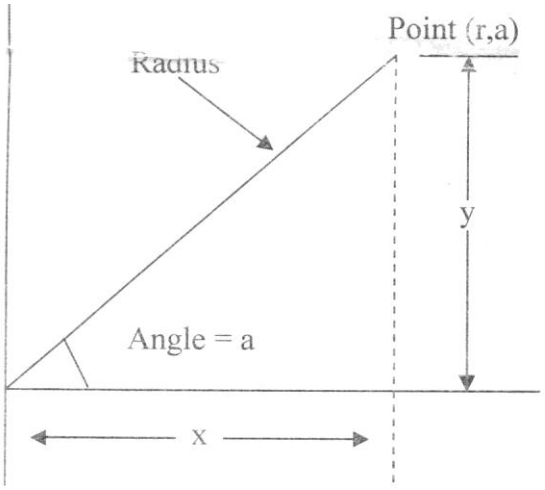
Write a main program to test the program.

5.12) Write a class to represent a vector (a series of float values). Include member functions to perform the following tasks:

a. To create the vector
b. To modify the value of a given element
c. To multiply by a scalar value
d. To display the vector in the form (10, 20, 30 .....)

Write a program to test your class.

7.12**)** Design a class Polar which describes a point in the plane using polar coordinates radius and angle. A point in polar coordinates is shown below.



Polar coordinates of a point

Use the overloaded + operated to add two objects of polar

Note that we cannot add polar values to two points directly. This requires first the conversion of points into rectangular co-ordinates, then adding the corresponding rectangular co-ordinates and finally converting the result back into polar co-ordinates. You need to use the following trigonometric formulae;

```
x = r* cos (a)
y = r* sin (a)
a = atan (x/y);                    // arc tangent
r = sqrt (x*x + y*y);
```

8.19**)** Assume that a bank maintains two kids of accounts for customers, one called as savings account and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed.

Create a class account that scores customer name, account number and type of account. From this derive the classescur_acct and sav_acct to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks:

- **a.** Accept a deposit from a customer and update the balance
- **b.** display the balance
- **c.** compute and deposit interest
- **d.** permit withdrawal and update the balance.
- **e.** check for the minimum balance, impose penalty, necessary and update the balance.

Do not use any constructors. Use member functions to initialize the class members.

9.13**)** Create a base class called shape. Use this class to store two double type, values that could be used to compute the area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base class, a member function get_data ( ) to initialize base class data members and another member function display_area ( ) to compute and display the area of figures. Make display_area ( ) as a virtual function and redefine this function in the derived classes to suit their requirements.

Using these three classes, design a program that will accept dimensions of a triangle or a rectangle interactively, and display the area.
Remember the two values given as input will be treated as lengths of two sides in the case of rectangles, and as base and height in the case of triangles, and used as follows:

Area of rectangle = x * y
Area of triangle = ½ * x* y

10.1) Write a program to read a list containing item name, item code, and cost interactively and produce a three column output as shown below.

Name	Code	Cost
Turbo C++	1001	250.95
C Primer	905	95.70
……	……	……...

Note that the name and code are left justified and the cost is right justified with a precision of two digits. Trailing zeros are shown.

DATA STRUCTURE PRACTICAL

1. Implement Stack Operation a) PUSH b) POP
2. Implementation of basic queue operation a) ADD b) DELETE
3. Addition and deletion of a node in a linked list
4. Minimum spanning tree
5. Shortest path algorithm
6. Quick sort
7. Merge sort
8. Polynomial addition using linked list (Using C++)

IV SEMESTER			
P-III	**JAVA PROGRAMMING**		**18PEMA4P2**
Hrs/Week: 6	**Hrs / Sem: 90**	**Hrs / Unit: 18**	**Credit: 4**

JAVA PROGRAMMING PRACTICAL

1. Write a JAVA program using simple arithmetic calculation.
2. Write a JAVA program using one dimensional array.
3. Write a JAVA program using classes and objects.
4. Write a JAVA program using overloading.
5. Write a JAVA program using overriding and inheritance
6. Write a JAVA program for payroll using interface
7. Write a JAVA program for matrix addition & multiplication.
8. Write a JAVA program to find NCR value using Recursion.
9. Write a JAVA program to find the volume of sphere & cone
10. Write a JAVA program to check the given number is perfect or not.
11. Write a JAVA program to check the given number is armstrong or not.
12. Write a JAVA program to solve the quadratic equation.
13. Write a JAVA program to find the factorial of a number.
14. Write a JAVA program to find the simple interest.
15. Write a JAVA program to display calendar details.
16. Write a JAVA program using package.
17. Write a JAVA program using Runge-kutta2 method.
18. Write a JAVA program using Runge-kutta4 method.
19. Write a JAVA program to input a year and check whether the year is a leap year or not.
20. Write a JAVA program to reverse the number.
21. Write a JAVA program to find the area and perimeter of triangle,circle.
22. Write a JAVA program to draw lines, rectangles and ovals in Applet.
23. Write a JAVA program to implement smiley face using Applet.
24. Write a JAVA program to create animation using Applet.
25. Write a JAVA program to create a frame window in Applet.

IDC SUBJECTS OFFERED BY DEPARTMENT OF MATHEMATICS TO OTHER MAJOR STUDENTS

II SEMESTER			
IDC-1	**ADVANCED DISCRETE MATHEMATICS**		**18PIMA21**
Hrs / Week: 3	**Hrs / Sem: 45**	**Hrs / Unit: 9**	**Credit: 3**

OBJECTIVE:

- To introduce the concepts of binary relations between two sets, an equivalence relation and combine relations using set operations and composition.
- To introduce the basic concept of probability and distribution.
- To study the concept of multigraph, directed or undirected, cyclic or acyclic, and determine the connectivity of a graph.

UNIT I:

Set Theory: Set and Elements – Subsets - Venn Diagram – Set Operations –Algebra of Sets- Duality – Finite Sets – Counting Principle – Classes of Sets – Power Sets – Partitions- Mathematical Induction.

UNIT II:

Relations: Product of Sets – Relations – Pictorial Representatives of Relations - Composition of Relations – Types of Relations - Closure properties – Closure Properties – Equivalence Relations –Partial Ordering Relations.

UNIT III:

Techniques of Counting: Introduction – Basic counting Principles - Mathematical Functions - Permutations - Combinations - The Pigeonhole Principle - The Inclusion–Exclusion Principle - Tree Diagrams.

UNIT IV:

Probability: Introduction – Sample Space and Events – Finite Probability Spaces – Conditional Probability – Independent Events – Independent Repeated Trials , Binomial Distribution- Random Variables.

UNIT V:

Graph Theory: Introduction- Data Structures – Graphs and Multigraphs – Subgraphs - Isomorphic and Homeomorphic Graphs - Paths, Connectivity - Traversable and Eulerian Graphs, Bridges of Königsberg - Labeled and Weighted Graphs - Complete, Regular, and Bipartite Graphs - Tree Graphs - Planar Graphs.

TEXT BOOK:

Seymour Lipschutz and Marc Lars Lipson- Discrete Mathematics – Scham's Series – Second Edition – Tata McGraw Hill Publications.
UNIT I: Chapter 1 (Section 1.1 to 1.10)
UNIT II: Chapter 2 (Section 2.1 to 2.9)
UNIT III: Chapter 6 (Section 6.1 to 6.8)
UNIT IV: Chapter 7 (Section 7.1 to 7.7)
UNIT V: Chapter 8 (Section 8.1 to 8.9)

III SEMESTER			
IDC- 2	**NUMERICAL & STATISTICAL METHODS**		**18PIMA31**
Hrs / Week: 3	**Hrs / Sem: 45**	**Hrs / Unit: 9**	**Credit: 3**

OBJECTIVE:

- To understand the foundation for numerical methods and statistics.
- To learn about the root finding problems using several methods.
- To learn about solving techniques of the systems of linear algebraic equations using Gauss elimination and LU decomposition

UNIT I: Algebraic and Transcendental Equations

Bisection Method – Iteration Method – The Method of False Position – Newton-Raphson – Method.

UNIT II: System of Linear Equation

Gauss Elimination, Gauss Jordon elimination – Triangularization method –Iterative Methods, Jacobi, Gauss-Seidal iteration, Iterative method for A-1.

UNIT III: Interpolation

Interpolation with equal intervals – Newton forward and backward formula – Central Difference Interpolation formula – Gauss forward and backward formula – Stirling's formula – Bessel's Formula - Numerical differentiation: Maximum and minimum values of a tabulated function. Numerical Integration: Trapezoidal Rule – Simpson's Rule – Numerical double Integration.

UNIT IV: Basic Distribution

Binominal distribution – Poisson distribution – Normal distribution – Properties and Applications.

UNIT V: Correlation and Regression

Correlation Coefficient – Rank correlation coefficient of determination – Linear regression – Method of least squares – Fitting of the curve of the form ax+b, ax2+bx+c, abx and axb – Multiple and partial correlation (3-variable only).

TEXT BOOK:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, *"Numerical Methods*", 3rd Edition, S. Chand, 2006.

UNIT I: Chapter 3(Section 3.1 to 3.4)

UNIT II: Chapter 4**(**Section 4.1 to 4.4, 4.8)

UNIT III: Chapter 8 (Section 8.1 to 8.8, 9.1 to 9.16)

2. S.C. Gupta and **V.K. Kapoor,** *"Fundamentals of Mathematical Statistics*", Sultan Chand &Sons, 1994.

UNIT IV: Chapter 7 (Section 7.1 to 7.4)

UNIT V: Chapter 10 (Section 10.1 to 10.7)

IDC COURSES (2018 - 2021)							
SEM	TITLE OF THE PAPER	S. CODE	H/W	C	MARKS		
					I	E	T
DEPT. OF ENGLISH							
II	CREATIVE WRITING	18PIEN21	3	3	25	75	100
III	ENGLISH FOR BUSINESS COMMUNICATION	18PIEN31	3	3	25	75	100
DEPT. OF HISTORY							
II	INDIAN HISTORY FOR COMPETITIVE EXAMINATIONS (1526- 1707A.D)	18PIHS21	3	3	25	75	100
III	INDIAN HISTORY FOR COMPETITIVE EXAMINATIONS (1707-1947 A.D)	18PIHS31	3	3	25	75	100
DEPT. OF COMMERCE							
II	BASIC ACCOUNTING SKILL	18PICO21	3	3	25	75	100
III	HUMAN RESOURCE MANAGEMENT	18PICO31	3	3	25	75	100
DEPT. OF MATHEMATICS							
II	ADVANCED DISCRETE MATHEMATICS	18PIMA21	3	3	25	75	100
III	NUMERICAL & STATISTICAL METHODS	18PIMA31	3	3	25	75	100
DEPT. OF CHEMISTRY							
II	INDUSTRIAL CHEMISTRY	18PICH21	3	3	25	75	100
III	INTRODUCTION TO CHEMINFORMATICS	18PICH31	3	3	25	75	100
DEPT. OF COMPUTER SCIENCE							
II	INTERNET CONCEPTS AND WEB DESIGN	18PICS21	3	3	25	75	100
III	DESKTOP PUBLISHING	18PICS31	3	3	25	75	100
DEPT. OF MICROBIOLOGY							
II	MICROBIOLOGY AND HUMAN HEALTH	18PIMB21	3	3	25	75	100
III	ENTREPRENEURSHIP IN MICROBIOLOGY	18PIMB31	3	3	25	75	100
DEPT. OF PHYSICS							
II	RENEWABLE ENERGY	18PIPH21	3	3	25	75	100
III	DIGITAL ELECTRONICS	18PIPH31	3	3	25	75	100
DEPT. OF ZOOLOGY							
II	MUSHROOM CULTURE	18PIZO21	3	3	25	75	100
III	POULTRY AND DAIRY SCIENCE	18PIZO31	3	3	25	75	100

SCHEME OF EXAMINATIONS UNDER CBCS

The medium of instruction in all PG courses is English and students must write the CIA Tests and Semester Examinations in English.

DISTRIBUTION OF MARKS FOR CIA AND SEMESTER EXAMINATIONS FOR POSTGRADUATE COURSES

SUBJECT	TOTAL MARKS	CIA TEST	SEMESTER EXAMINATION	PASSING MINIMUM		
				CIA EXAM.	SEM. EXAM.	OVER ALL
Theory	100	25	75	Nil	38	50
Practical (6 hrs.)	100	40	60	Nil	30	50
Practical (4 hrs.)	50	20	30	Nil	15	25
Project	100	nil	Report - 60 marks Viva Voce - 40 marks	Nil	Nil	50

DIVISION OF MARKS FOR CIA TEST

SUBJECT	MARKS	ASSIGNMENT OR SEMINAR FOR PG	RECORD NOTE	TOTAL MARKS
Theory	20	5	--	**25**
Practical (6hrs)	30	--	10	**40**
Practical (4hrs)	15	--	5	**20**

1. The duration of each CIA Test is ONE hour and the Semester Examination is THREE hours.
2. Three CIA tests of 20 marks each will be conducted and the average marks of the best two tests out of the three tests will be taken.
3. The I test will be based on the first 1.5 units of the syllabus, the II test will be based on the next 1.5 units of the syllabus and the III test will be based on the next 1.5 units of the syllabus.
4. Two assignments for Undergraduate, Certificate, Diploma and Advanced Diploma Courses and two assignments OR two seminars for Postgraduate Courses has to be submitted.
5. The duration and the pattern of question paper for practical examination may be decided by the respective Boards of Studies. However, out of 60 marks in the semester practical examination, 10 marks may be allotted for record and 50 marks for practical.
6. Two internal practical tests of 30/15 marks each will be conducted for science students in the respective semester and the average will be taken. The record marks allotted for the above practicals are 10 and 5 respectively.

QUESTION PAPER PATTERN FOR CIA TEST (THEORY)

Duration: 1 Hr **Maximum Marks: 20**

Section	Question Type	No. of Questions & Marks	Marks
A	No Choice Answer should not exceed 75 words	2 Questions 2 marks each	2 x 2 = 4
B	Internal choice (Either or type) Answer should not exceed 200 words	2 Questions 4 marks each	2 x 4 = 8
C	Open Choice (Answer ANY ONE out of Two) Answer should not exceed 400 words	1 Question 8 marks	1 x 8 = 8
		TOTAL	**20 MARKS**

QUESTION PAPER PATTERN FOR SEMESTER EXAMINATION (THEORY)

Duration: 3 Hrs **Maximum Marks: 75**

Section	Question Type	No. of Questions & Marks	Marks
A	No Choice Answer should not exceed 75 words	10 Questions - 2 marks each (2 Questions from each unit)	10 x 2 = 20
B	Internal choice (Either or type) Answer should not exceed 200 words	5 Questions with internal choice. Each carries 5 marks (Two questions from each unit)	5 x 5 = 25
C	Open Choice (Answer ANY THREE out of FIVE) Answer should not exceed 400 words	3 Questions out of 5 - 10 marks each (1 Question from each unit)	3 x 10 = 30
		TOTAL	**75 MARKS**

SADAKATHULLAH APPA COLLEGE

(AUTONOMOUS)

(Reaccredited by NAAC with an 'A' Grade with a CGPA of 3.40 out of 4.00 in the III cycle An ISO 9001:2015 Certified Institution)

RAHMATH NAGAR, TIRUNELVELI- 11,

Tamilnadu

RESEARCH DEPARTMENT OF MATHEMATICS

CBCS SYLLABUS

For

M.Phil. MATHEMATICS

(Applicable for students admitted in June 2018 and onwards)

(As per the Resolutions of the Academic Council Meeting held on 17.10.2018)

M.Phil Syllabus –COURSE STRUCTURE

(Applicable for students admitted in June 2018 and Onwards)

Program Outcomes of M.Phil. in Mathematics:

At the end of the programme, the students will be able to:

- Apply knowledge of Mathematics, in all the fields of learning including higher research and its extensions.
- Apply the concepts of Latex and Matlab in typeset mathematical documentation.

SADAKATHULLAH APPA COLLEGE (AUTONOMOUS)
RESEARCH DEPARTMENT OF MATHEMATICS
M.Phil. Mathematics Syllabus
(Applicable for students admitted in June 2018 and onwards)
COURSE STRUCTURE

I SEMESTER				**II SEMESTER**		
COURSE	**H/W**	**C**		**COURSE**	**H/W**	**C**
Core 1	4	4		Project and Viva - Voce	12	12
Core 2	4	4				
Project Oriented Elective Course (Theory)	4	4				
TOTAL	**12**	**12**		**TOTAL**	**12**	**12**

DISTRIBUTION OF HOURS, CREDITS, NO. OF PAPERS, & MARKS

SUBJECT	**HOURS**	**CREDITS**	**NO. OF PAPERS**	**MARKS**
Core	8	8	2	**200**
Project Oriented Elective Course (Theory)	4	4	1	**100**
Project and Viva-voce	12	12	1	**100**
TOTAL	**24**	**24**	**4**	**400**

TITLE OF THE PAPERS
M. PHIL. MATHEMATICS (2018 - 2021)

(The candidate should select any one of the Area Papers in the first semester related to their proposed topics of research)

SEM	**P**	**TITLE OF THE PAPER**	**SUB. CODE**	**H/W**	**C**	**MARKS**		
						I	**E**	**T**
I	DSC1	Research and Educational Methodology	18MCMA11	4	4	25	75	100
	DSC2	Commutative Algebra	18MCMA12	4	4	25	75	100
	DSE	A) Algebraic Graph Theory	18MEMA1A	4	4	25	75	100
		B) Fuzzy Mathematical Concepts	18MEMA1B					
		C) Advanced Graph Theory	18MEMA1C					
		D) Algebraic Topology	18MEMA1D					
II	D	Project and Viva-Voce	18MDMA21	-	12	--	100	100
TOTAL				**12**	**24**	**75**	**325**	**400**

M. Phil. MATHEMATICS SYLLABUS

(Applicable for students admitted in June 2018 and onwards)

I SEMESTER			
DSC 1	**RESEARCH AND EDUCATIONAL METHODOLOGY**		**18MCMA11**
Hrs/Week: 4	**Hrs/ Sem: 60**	**Hrs/Unit: 12**	**Credits: 4**

Course Objectives

- Provide the overview of research methodology.
- Develop their skills in Latex and MATLAB.
- Introduce the required mathematical research foundations of the Banach Algebra.
- Improve their skills in Teaching methodology

UNIT I: Research Methodology: What is Research - Literature Collection - Research Report - Research Report (Formatting and Typing).

UNIT II: LATEX: Drawing with Latex - Presentation Material – Letters - **MATLAB:** Graphics – Basics 2D Plots – Using subplot for Multi Graphs – 3D Plots.

UNIT III: Banach Algebras : Introduction – Complex homomorphism – Basic Properties of spectra – Gelfand Mazur Theorem.

UNIT IV: Commutative Banach Algebras: Ideals and homomorphisms – Wiener's lemma – Gelfand transforms - Involutions – Gelfand Naimark Theorem.

UNIT V: **Methodology of Teaching**: Teaching – Objectives of Teaching, Phases of Teaching – Teaching Methods: Lecture Method, Discussion Method, Discovery Learning. Inquiry, Problem Solving Method, Project Method, Seminar – Integrating ICT in Teaching: Individualized Instruction, Ways for Effective Presentation with Power Point – Documentation – Evaluation : Formative, Summative and Continuous and Comprehensive Evaluation – Later Adolescent Psychology: Meaning, Physical, Cognitive, Emotional, Social and Moral Development – Teaching Later Adolescents.

TEXT BOOKS:

1. Research Methodology for Biological Sciences by N. Gurumani - MJP Publishers.

UNIT I- Chapters 1,2,4,7

2. Guide to LATEX by Helmut Kopka and Patrick W. Daly, Fourth Edition, Addison – Wesley, Pearson Education, 2004.

UNIT II- Chapters 16, 17, 18

3. Getting Started with MATLAB – A quick introduction for Scientist and Engineers by Rudra Pratap, Oxford University Press 2003.

UNIT II- Chapters 6 (6.1 – 6.3)

4. Functional Analysis (Second Edition) by Walter Rudin- Tata McGraw-Hill Publishing Company Ltd, New Delhi.

UNIT III: Chapter 10 (10.1 to 10.20)

UNIT IV: Chapter 11 (11.1 to 11.20)

References: (For UNIT – V)

1. Sampath.K., Panneerselvam. A and Santhanam. S., (1984), Introduction to educational technology. (2nd revised). New Delhi: Sterling Publishers.
2. Sharma.S.R. (2003). Effective classroom teaching modern methods, tools and techniques. Jaipur:Mangal Deep.
3. Vedanayagam, E.G. (1989). Teaching technology for college teachers, New York : Sterling Publishers.

Course Learning Outcomes:

- After successful completion of this course, students will be able to understand research methods and typeset mathematical document in Latex and MATLAB
- Possess the basic knowledge about Banach Algebra and Spectral theory
- Acquire detailed knowledge about Teaching Methods, Integrating ICT in Teaching and Ways for Effective Presentation with Power Point, Documentation and Evaluation.

SEMESTER I			
DSC 2	**COMMUTATIVE ALGEBRA**		**18MCMA12**
Hrs/Week: 4	**Hrs/ Sem: 60**	**Hrs/Unit: 12**	**Credits: 4**

Course Objectives:

- Introduce the concept of Nil radical and Jacobson radical and operations on ideals.
- Study different types of modules and Exact Sequences.
- Discuss local properties of rings and modules fractions.
- Establish Noetherian Rings and Artin Rings.

UNIT I: Rings and Ideals: Rings and ring homomorphisms – Ideals Quotient rings – Zero-divisors Nilpotent elements Units – Prime ideals and maximal ideals – Nilradical and Jacobson radical – Operations on ideals – Extension and contraction.

UNIT II: Modules: Modules and module homomorphisms – Submodules and quotient modules – Operations on submodules – Direct sum and product – Finitely generated modules – Exact sequences.

UNIT III: Rings and Modules fractions: Local properties – Extended and contracted ideals in rings of fractions.

UNIT IV: Integral Dependence and Valuations: Integral dependence – The going-up theorem – Integrally closed integral domains. The going-down theorem.

UNIT V: Noetherian Rings: Primary decomposition in Northerian Rings-Artin Rings.

TEXTBOOK:

Introduction to Commutative Algebra by M.F Atiyah and I.G.Macdonald Addison Wesley Publishing Company.

UNIT I - Chapter 1
UNIT II - Chapter 2 Sections: 2.1 – 2.11
UNIT III- Chapter 3
UNIT IV - Chapter 5 Sections: 5.1 – 5.16
UNIT V - Chapters 7 and 8.

Course Learning Outcomes:

- Allocate features to finitely generated modules.
- Access properties implied by different modules on commutative rings.
- Analyze the Noetherian Rings and Artin Rings by giving some examples.

PROJECT ORIENTED ELECTIVE COURSE

I SEMESTER			
DSE A	**ALGEBRAIC GRAPH THEORY**		**18MEMA1A**
Hrs/Week: 4	**Hrs/ Sem: 60**	**Hrs/Unit: 12**	**Credits: 4**

Course Objectives:

- Introduce the concept of Spectrum of a graph and homology of graphs
- Discuss the relation between the spectrum and verterx colouring
- Study different properties of Automorphism of graphs

UNIT I: Linear Algebra in Graph Theory**:** Spectrum of a Graph – Regular Graphs and line graphs – The homology of graphs.

UNIT II: Spanning Trees and associated Structures – Complexity - Determinant Expansions.

UNIT III: Colouring Problems – Vertex Colouring and the Spectrum – The Chromatic Polynomial - Edge Subgraph Expansion.

UNIT IV: The logarithmic Transformation – The Vertex subgraph Expansion – The Tutte Polynomial – The Chromatic Polynomial and Spanning Trees.

UNIT V: Symmetry and Regularity of Graphs – General Properties of Graph Automorphism – Vertex Transitive Graphs – Symmetric Graphs.

TEXT BOOK:

Algebraic Graph Theory by Norman Biggs – Cambridge University Press 1974.

UNIT I- Sections 2, 3, 4.

UNIT II- Sections 5,6,7.

UNIT III- Sections 8,9,10.

UNIT IV- Sections 11,12,13.

UNIT V- Sections 14,15,16.

Course Learning Outcomes:

- Understand the concept of Spectrum of graphs.
- To develop research level thinking in the field of pure and applied mathematics.
- Keep on discovering new avenues in the chosen field

I SEMESTER			
DSE B	**FUZZY MATHEMATICAL CONCEPTS**		**18MEMA1B**
Hrs/Week: 4	**Hrs/ Sem: 60**	**Hrs/Unit: 12**	**Credits: 4**

Course Objectives:

- Make students acquainted with basic concepts and applications of fuzzy sets theory.
- Study different properties of Fuzzy sets in Algebra and Analysis.
- Applying the concepts of Fuzzy sets in different fields of Mathematics like Graph Theory, Topology and Algebra etc.

UNIT I: Fuzzy subsets-Partially Ordered Sets- Lattices and Boolean Algebras-L-fuzzy sets-Visual Representation of a fuzzy subset-Operations on fuzzy subsets.

UNIT II: Disjunctive Sum- α level set-Properties of fuzzy Subsets of a set-Algebraic Product and sum of two fuzzy subsets-Properties Satisfied by Addition and Product-Cartesian Product of fuzzy Subsets.

UNIT III: Fuzzy Subgroup-Homomorphic and Pre-image of Subgroupoid.

UNIT IV: Fuzzy Subfields and Fuzzy Subspaces-Fuzzy Algebra over Fuzzy Field-Finite Group and Finite Field.

UNIT V: An Over View- Fuzzy Real Numbers- Fuzzy Metric Space.

Text Book:

Fuzzy Mathematical Concepts by S.Nanda, N.R.Das, Narosa Publishing House PVT.LTD.

UNIT I : Chapter 1 : Session: 1.1-1.7

UNIT II : Chapter 1 : Session: 1.8-1.13

UNIT III : Chapter 3 : Session: 3.1,3.2,3.3

UNIT IV : Chapter 4 : Session: 4.1,4.3,4.4

UNIT V : Chapter 8.

Course Learning Outcomes:

- Students acquire necessary knowledge of important parts of fuzzy set theory, which will enable them to create effective mathematical models of technical phenomena.
- Develop research level thinking in the field of applied mathematics.

I SEMESTER			
DSE C	**ADVANCED GRAPH THEORY**		**18MEMA1C**
Hrs/Week: 4	**Hrs/ Sem: 60**	**Hrs/Unit: 12**	**Credits: 4**

Course Objectives

- Develop problem solving skills in different areas of Graph Theory such as Domination in Graphs.
- Applying the concepts of graph domination at appropriate points of graph theory.
- Motivation to take up research in domination as their career.

UNIT I: Domination in Graphs: Introduction – Terminology and concepts – Applications – Np completeness – History of domination in graphs.

UNIT II: Bounds on the Domination Number: Bounds in terms of order - Bounds in terms of order, degree and packing – Bounds in terms of order and size.

UNIT III: Bounds in terms of degree, diameter and girth – Bounds in terms of independence and covering – Domination, Independence and Irredundance: Hereditary and super hereditary – Independent sets

UNIT IV: Dominating sets – Irredundant sets – The Domination Chain – Extension using maximality and minimality .

UNIT V: Efficiency, Redundancy and Their Duals – Introduction – Efficient Dominating Set - Codes and Cubes

Text Book:

Fundamentals of Domination in graphs by T. W. Haynes, S. T. Hedetniemi and P. J. Slater Marcel Decker.

UNIT I: Chapter 1: Section 1.1 – 1.13
UNIT II: Chapter 2: Section 2.1 – 2.3
UNIT III: Chapter 2: Section 2.4, 2.5 and Chapter 3: Section 3.1, 3.2
UNIT IV: Chapter 3: Section 3.3 – 3.6
UNIT V : Chapter 4: Section 4.1,4.2.

Course Learning Outcomes:

- After completing this course, the student will be able to understand the concepts of domination, Independence and Irredundance.
- Apply the concept of dominations in real time life.
- Study the concepts of Bounds on the Domination Number in terms of degree, diameter and girth.

I SEMESTER			
DSE D	**ALGEBRAIC TOPOLOGY**		**18MEMA1D**
Hrs/Week: 4	**Hrs/ Sem: 60**	**Hrs/Unit: 12**	**Credits: 4**

Course Objectives:

- Introduce the algebraic concepts in Topological spaces and study the basic properties of homotopy of Paths
- Study Separation theorems in the plane such as Jordan Separation theorem and Nulhomotophy lemma.
- Discuss the winding number of a simple closed curve in topological spaces.

UNIT I: The Fundamental Group: Homotopy of Paths – The Fundamental Group – Covering Spaces.

UNIT II: The Fundamental Group of the Circle – Retractions and Fixed Points

UNIT III: Deformation Retracts and Homotopy Type –The fundamental Group of S^n – Fundamental Group of some surfaces.

UNIT IV: Separation Theorems in the plane : The Jordan Separation Theorem – Nulhomotopy lemma – Invariance of Domain

UNIT V: Imbedding Graphs in the Plane – The winding number of a simple closed curve.

TEXT BOOK:

Topology Second Edition by James R. Munkres, PHI Learning Private Limited, Delhi.
UNIT I : Chapter 9 : Section 51 – 53
UNIT II : Chapter 9 : Section 54 – 55
UNIT III : Chapter 9 : Section 58 - 60
UNIT IV : Chapter 10: Sections 61 – 62
UNIT V : Chapter 10 : Sections 64 – 66

Course Learning Outcomes:

- After the successful completion of this course, students will be able to understand the concept of homotopy in topological spaces.
- Student will recall and understand fundamental concepts in Algebra.
- Access properties implied by imbedding graphs in the plane.

II SEMESTER		
D	**DISSERTATION**	**18MDMA21**
Hrs/Week: 12	**Hrs/ Sem : 180**	**Credits: 12**

The following guidelines have to be followed by every candidate while preparing his/her M.Phil. Dissertation:

- The Dissertation should be typed in English.
- The first page, declaration and certificate of the dissertation should be according to the model given at the end of this.
- Dissertation text should be typed in LaTeX with size 12 / 13 on A4 size Executive bond quality paper with double line spacing. Each page should contain at least 20 lines.
- The dissertation should be submitted in duplicate.
- The number of pages in M.Phil. Dissertation should be not less than 80 pages inclusive of bibliography and Annexure.
- Two bound copies of the M.Phil. Dissertation duly signed by the Guide and Head of the Department should be submitted through the Controller of Examinations along with the CD containing the softcopy of the Dissertation in PDF format.
- Candidates shall submit the dissertation to the Controller of Examinations through the Supervisor and Head of the Department within 6 months but not earlier than 5 months from the date of start of the second semester.
- The M.Phil. scholars should attend at least one of the following:
  training programmes / Workshops / Seminars / Symposiums, etc., and that they should also have a paper either published or received for acceptance in an ISSN / Reputed Journal before submitting the Dissertation. M.Phil. Scholars shall present at least one research paper in a conference or seminar as per UGC norms. Photo copy of the publication/Letter of acceptance for publication should be given as Annexure at the end of the Dissertation. **Scholars who fail to comply with the above are not eligible for the submission of their Dissertation**

- Both the Internal as well as External Examiner award 100 marks each for the Dissertation. The distribution of mark will be **60 marks for the Dissertation and 40 marks for the Public Viva-voce Examination**. In the Public Viva-voce Examination the M.Phil. Scholars should present their Dissertation work with PowerPoint Presentation. The Division of marks for the Dissertation is as mentioned below:

Particulars	**Internal Examiner**	**External Examiner**
Wording of Title	5	5
Objectives/ Formulation including Hypothesis	5	5
Review of Literature	10	10
Relevance of Dissertation to Social Needs	5	5
Methodology/ Technique/ Procedure Adopted	15	15
Summary/ Findings/ Conclusion	5	5
Bibliography/ Annexure/ Foot notes	10	10
Training/ Seminar/ Workshop	5	5
	60	**60**

(Model for the Title Page of the Dissertation)

TITLE OF THE DISSERTATION

Dissertation Submitted to the
Sadakathullah Appa College (Autonomous)
in partial fulfilment of the requirements for the award of the degree of

MASTER OF PHILOSOPHY (MAJOR)
Submitted by

NAME OF THE CANDIDATE

(REGISTER NO. XXXXXXXX)

Under the guidance of

NAME OF THE GUIDE

Designation of the Guide
Sadakathullah Appa College (Autonomous)
Tirunelveli – 627011

RESEARCH DEPARTMENT OF (MAJOR)
SADAKATHULLAH APPA COLLEGE (AUTONOMOUS)
TIRUNELVELI – 627011
MONTH, YEAR

(Model for the Certificate of the Dissertation)

Sadakathullah Appa College (Autonomous)

Rahmath Nagar, Tirunelveli – 627011

CERTIFICATE

Certified that the dissertation work with the title, **"TITLE OF THE DISSERTATION"** submitted by **NAME OF THE CANDIDATE** with the register number XXXXXXX in partial fulfilment of the requirements for the award of the degree of **Master of Philosophy in (Major) at the Research Department of (Major), Sadakathullah Appa College (Autonomous),** is a work done by the candidate during the period 20XX-XX, under my guidance and supervision and this dissertation or any part thereof has not been submitted elsewhere for any other Degree or Diploma.

Tirunelveli – 627011
DD-MM-YEAR

<<Signature of the HOD with date>>
<<Name of the HOD>>
<<Academic Designation of the HOD>>
<<Name of the Department>>
Sadakathullah Appa College (Autonomous)
Tirunelveli - 11

<<Signature of the Supervisor with date>>
<<Name of the Supervisor>>
<<Academic Designation of the Supervisor>>
<<Name of the Department>>
Sadakathullah Appa College (Autonomous)
Tirunelveli - 11

Viva-Voce Examination for the candidate was conducted on ……..……

Internal Examiner External Examiner

(Model for the Declaration by the Candidate)

Name of the Candidate,

M.Phil. Scholar, (Register No.: XXXXXXX)
Research Department of XXXXXXXX,
Sadakathullah Appa College (Autonomous),
Rahmath Nagar, Tirunelveli – 627011

DECLARATION BY THE CANDIDATE

I hereby declare that, the dissertation with the title, **"TITLE OF THE DISSERTATION"** submitted in partial fulfilment of the requirements for the award of the degree of **Master of Philosophy in XXXXXXXX** at **the Research Department of XXXXXXXX, Sadakathullah Appa College (Autonomous)**, is my original work done under the guidance of **Name of the Guide, Designation of the Guide, Sadakathullah Appa College (Autonomous), Tirunelveli – 11** and this work has not been submitted elsewhere for any other Degree or Diploma.

Tirunelveli – 627011
DD-MM-YEAR **(Signature of the Candidate)**

Countersigned

1.Signature and Seal of the Guide **2. Signature and Seal of the HOD**