VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
[AUTONOMOUS]
ELAYAMPALAYAM, TIRUCHENGODE -637 205.
DEPARTMENT OF MATHEMATICS
M.Sc. – MATHEMATICS
COURSE PATTERN AND SCHEME OF EXAMINATIONS UNDER CBCS
For the Candidates admitted from the year 2017-2018

SEM	SUBJECT CODE	COURSE	SUBJECT TITLE	Hrs/ Week	CREDIT	INT. MARK	EXT. MARK	TOT. MARK
I	17P1MA01	Core Course-I	Abstract Algebra	6	5	25	75	100
	17P1MA02	Core Course-II	Real Analysis	6	5	25	75	100
	17P1MA03	Core Course-III	Fluid Dynamics	6	5	25	75	100
	17P1MA04	Core Course-IV	Ordinary Differential Equations	6	5	25	75	100
	17P1MAE01	Core Based Elective-I	Elective from Group-A (Graph Theory)	6	5	25	75	100
TOTAL				**30**	**25**	**125**	**375**	**500**
II	17P2MA05	Core Course-V	Linear Algebra	6	5	25	75	100
	17P2MA06	Core Course-VI	Complex Analysis	6	5	25	75	100
	17P2MA07	Core Course-VII	Advanced Real Analysis	6	5	25	75	100
	17P2MA08	Core Course-VIII	Partial Differential Equations	6	5	25	75	100
	17P2MAE03	Core Based Elective-II	Elective from Group-B (Mathematical Methods)	6	5	25	75	100
TOTAL				**30**	**25**	**125**	**375**	**500**

III	17P3MA09	Core Course-IX	Measure Theory and Integration	7	5	25	75	100
	17P3MA10	Core Course-X	Functional Analysis	7	5	25	75	100
	17P3MA11	Core Course-XI	Numerical Analysis	6	4	25	75	100
	17P3MAE05	Core Based Elective-III	Elective From Group-C Optimization Techniques	6	4	25	75	100
		EDC	EDC	4	4	25	75	100
			Human Rights		1	25	75	100
TOTAL				**30**	**23**	**150**	**450**	**600**
IV	17P4MA12	Core Course-XII	Topology	6	4	25	75	100
	17P4MA13	Core Course-XIII	Probability Theory	6	4	25	75	100
	17P4MA14	Core Course-XIV	Number Theory	6	5	25	75	100
	17P4MAE07	Core Based Elective-IV	Elective from Group-D (Differential Geometry)	6	4	25	75	100
	17P4MAPR01	PROJECT	Project	6	5	50	150	200
TOTAL				**30**	**23**	**125**	**375**	**600**
GRAND TOTAL				**120**	**96**	**550**	**1650**	**2200**

ELECTIVE PAPERS:

GROUP-A

17P1MAE01 GRAPH THEORY

17P1MAE02 CODING THEORY

GROUP-B

17P2MAE03 MATHEMATICAL METHODS

17P2MAE04 NEURAL NETWORKS

GROUP-C

17P3MAE05 OPTIMIZATION TECHNIQUES

17P3MAE06 CONTROL THEORY

GROUP-D

17P4MAE07 DIFFERENTIAL GEOMETRY

17P4MAE08 CRYPTOGRAPHY

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M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	**17P1MA01**	**Title**		
		CORE I: ABSTRACT ALGEBRA	**Semester**	I
Hrs/Week	6		**Credits**	05

Unit I : Group Theory **(12 Hrs)**

Another counting principle –Sylow's theorem- Direct products

Unit II : Ring Theory **(12 Hrs)**

Euclidean rings-A particular Euclidean ring-Polynomial rings- Polynomials over the rational field. .

Unit III :Fields **(12 Hrs)**

Extension Fields-Roots of Polynomials-More about roots.

Unit IV: Fields **(12Hrs)**

Elements of Galois theory-Finite Fields.

Unit V:Linear Transformations

Canonical forms : Triangular form-Trance and Transpose –Hermitan,Unitary and normal Transformations.

(12 Hrs)

TEXT BOOK:

1.HERSTEIN(II EDITION), Topics in algebra

REFERENCE BOOKS:

1.M.Artin, Algebra,Prentiece-Hall,Englewood Cliff,1991.

2.T.W.Hungerford, Algebra,Springer,New York 1974

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M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	17P1MA02	**Title**		
		CORE II: REAL ANALYSIS	**Semester**	I
Hrs/Week	6		**Credits**	05

UNIT I:Continuity **(12 Hrs)**

Limits of Functions-Continuous functions- continuity and compactness-continuity and connectedness – discontinuities-monotonic functions-infinite limits and limits at infinity.

Unit II: Measure sets **(12 Hrs)**

Length of open sets and closed sets- Inner and outer measure, measurable sets- Properties of measurable sets- Measurable functions- Definition and existence of the lebesgue integral for bounded functions

Unit III: Riemann-Stieltjes Integral **(12 Hrs)**

The Riemann-Stieltjes Integral- Definitions and existence of integral- properties of the integral-integration differentiation- Integration of vectors-valued functions-Rectifiable Curves**.**

Unit IV: Sequences and series of functions **(12 Hrs)**

Sequences and series of functions- discussion on main problems-uniform convergence-uniform convergence and continuity-uniforn convergence and integration-uniform convergence and differentiation Equicontinuous Families of Functions-Stone Weierstrass theorem

UNIT V: Some Special Functions and Functions of Several variables **(12 Hrs)**

Some special functions- Power series-The Gamma Functions-Functions of several Variables-Linear transformation-The Cintraction Principle- The Inverse function Theorem-The implicit function Theorem

TEXT BOOK:

Walter Rudin, ***Principles of Mathematical Analysis***, Third Edition, Mc Graw Hill Book Co.., New Delhi,1876.

REFERENCE BOOKS:

1. **Tom M .Apostol,** ***Mathematical Analysis***, Second Edition,Narosa Publishing House,2002.

2. **H.L.Royden,** ***Real Analysis***, Third Edition,Prentice-Hall of India,New Delhi,2009

3. W.J. Kaczor and M.T. Nowak, "Problems in Mathematical Analysis I – Real Numbers , Sequences and Series", American Mathematical Society, 2000.

4. W.J. Kaczor and M.T. Nowak, "Problems in Mathematical Analysis II – Continuity and Differentiation", American Mathematical Society, 2000.

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	17P1MA03	**Title**		
		CORE III: FLUID DYNAMICS	**Semester**	I
Hrs/Week	6		**Credits**	5

Unit -I : Kinematics of Fluids in Motion **(12 Hrs)**

Real Fluids and Ideal Fluids- Velocity of a Fluid at a Point- Stream lines and path lines: Steady and Unsteady Flows- Problems

Chapter -2 (Sec 2.1 – 2.10)

Unit-II : Equations of Motion of a Fluid **(12 Hrs)**

Pressure at a Point in a Fluid at Rest-Pressure at a Point in a Moving Fluid-Conditions at a Boundary of Two inviscid Immiscible Fluids-Euler's Equations of Motion –Bernoulli's Equation – Worked Examples-Discussion of the Case of Steady Motion under Conservative Body Forces.

Chapter- 3 (Sec 3.1 – 3.7)

Unit – III: Some Three –Dimensional Flows **(12 Hrs)**

Introduction-Sources, Sinks and Doublets-Images in a Rigid Infinite Plane-Axi-Symmetric Flows: Stokes's Stream Function.

Chapter -4 (Sec 4.1 – 4, 4.5)

Unit IV: Some Two -Dimensional Flows **(12 Hrs)**

Meaning of Two -Dimensional Flow-Use of Cylindrical Polar Co-ordinates-the Stream Function –the Complex Potential for Two –Dimensional, Irrotational, In Compressible Flow – Complex Velocity Potential for Standard Two –Dimensional flows-Some Worked Examples.

Chapter -5 (Sec 5.1 – 5.6)

Unit V: Viscous Flow **(12Hrs)**

Stress Components in a Real Fluid –Relations between Cartesian Components of Stress-Translational Motion of Fluid Element-the Rate of Strain Quadric and Principal Stresses- Some Further Properties of the Rate of Strain Quadric-Stress Analysis in Fluid Motion- Problems.

Chapter -5 (Sec 8.1 – 8.9)

TEXT BOOK :

F.Chorlton, ***Text book of Fluid Dynamics***, CBS Publication New Delhi, 2004.

REFERENCE BOOKS:

1. **G.K.Batchaelor**, ***An Introduction to Fluid Mechanics***, Foundation Books,New Delhi,2002.

2. **S.W .Yuan**, ***Foundations of Fluid Mechanics,*** Prentice Hall of India Pvt. LtD., New Delhi,2000.

3. **R.K.Rathy,** ***An Introduction to Fluid Dynamic***, IBH Publ.Comp.New Delhi, 2002.

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	17P1MA04	**Title**		
		CORE IV: ORDINARY DIFFERENTIAL EQUATIONS	**Semester**	I
Hrs/Week	6		**Credits**	05

UNIT I: Linear Equations with Constant Coefficients **(12 Hrs)**

Introduction -Second order homogeneous equations –Initial value problem- Linear dependence and independence- A formula for the Wornskian.

Chapter –2(Sec 1–5)

UNIT II: Linear Equations with Constant Coefficients **(12 Hrs)**

Non –homogeneous equations of order two – Homogeneous and non –homogeneous equations of order n –Initial value problem- A special method to solve a non-homogeneous equation – Algebra of constant coefficient.

Chapter –2 (Sec 6– 11)

UNIT III: Linear Equations with Variable Coefficients **(12 Hrs)**

Initial value problems for homogeneous equations –Solutions of homogeneous equations - Wronskian and linear independence – Reduction of the order of homogeneous equation **–** The Legendre equation.

Chapter – 3 (Sec 1–5)

UNIT IV: Linear Equations with Regular Singular points **(12 Hrs)**

Linear equations with regular singular points – Euler equation-second order equations with regular singular points – solutions and properties of Bessel's equation.

Chapter – 3 (Sec 8) , Chapter- 4(Sec 1 to 4, 7,8)

UNIT V: First Order Equation – Existence and Uniqueness **(12 Hrs)**

Introduction – Existence and uniqueness of solutions of first order equations – Equations with variable separable –Exact equations – Method of successive approximations – Lipschitz Condition – Convergence of the successive approximations.

Chapter – 8 (Sec 6.1 – 6.6)

TEXT BOOK :

Earl A. Coddington, ***An Introduction to Ordinary Differential Equation***, Prentice Hall of India, New Delhi, 2011.

REFERENCE BOOKS :

1. **R.P.Agarwal** and **Ramesh C.Gupta**, ***Essentials of Ordinary Differential Equation***, Mc Graw Hill, New York, 1991.
2. **D.Somasundram**, ***Ordinary Differential Equations***, Narosa Publishing House, Chennai – 2002.
3. **D.Raj, D.P.Choudhury** and **H.I.Freedman**, ***A Course in Ordinary Differential Equations***, Narosa Publishing House, Chennai – 2004.

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M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	17P2MA05	**Title**		
		CORE V:	**Semester**	II
Hrs/Week	6	**LINEAR ALGEBRA**	**Credits**	05

UNIT-I: Linear transformations **(12Hrs)**

Linear transformations- the algebra of Linear transformations- Isomorphism- Representationof Transformation by matrices. Chapter - 3 (Sec 3.1 – 3.4)

UNIT-II: Polynomials **(12 Hrs)**

Algebra- the algebra of polynomials- lagrange interpolation- polynomial ideals- theprime factorization of a polynomial. Chapter - 4 (Sec 4.1 – 4.5)

UNIT-III: Determinants **(12Hrs)**

Commutative rings- determinant functions – permutations & the uniqueness of determinants-additional properties of determinants. Chapter - 5 (Sec 5.1- 5.4)

UNIT-IV: Elementary canonical forms **(12 Hrs)**

Elementary canonical forms- introduction- characteristic values- annihilatery polynomials-invariant subspaces- simultaneous triangulation, simultaneous diagonalization. Chapter - 6 (Sec 6.1 – 6.5)

UNIT-V: The rational & Jordan forms **(12 Hrs)**

Cyclic subspaces & annihilaters – cyclic decompositions & the rational form- the Jordan form.Chapter - 7 (Sec 7.1 – 7.3)

TEXT BOOK :

Kenneth Hoffman & Ray Kunze, *Linear algebra* , 2nd Edition, Prentice Hall of India Private Limited,New Delhi, 2015.

REFERENCE BOOKS :

1. Jim Defranza and Daniel Gagliardi, *Introduction to Linear Algebra with application*, Indian Edition,2011.

2. V. Krishnamurthy, *An Introduction to Linear Algebra*, West press Pvt. Ltd., New Delhi, 1938.

3. H. Friedberg, A.J.Insel & L.E.Spence, *Linear Algebra*, PHI learning Pvt. Ltd., New Delhi, 2009.

4. L.A. Geza. Schay, *Introduction to Linear Algebra*, Narosa publishing House, New Delhi, 1998.

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	17P2MA06	**Title**		
		CORE VI: COMPLEX ANALYSIS	**Semester**	II
Hrs/Week	6		**Credits**	05

Unit I: **(12 Hrs)**

Introduction to the concept of analytic function: Limits and continuity – Analytic functions – Polynomials – Rational functions – Conformality : Arcs and closed curves – Analytic functions in regions – Conformal Mapping – Length and Area – Linear Transformations: The Linear group – The Cross ratio – Elementary Riemann Surfaces.

Chapter – 2 (Sec 1.1 – 1.4), Chapter – 3 (Sec 2.1 – 2.4, 3.1, 3.2, 3.4)

Unit II: **(12 Hrs)**

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 Removable singularities, Taylor's Theorem – Zeros and Poles – The Local Mapping – The Maximum principle – chains and cycles.

Chapter – 4 (Sec 1.1 – 1.5, 2.1 – 2.3, 3.1 - 3.4, 4.1)

Unit III: **(12 Hrs)**

The Calculus of Residues: The Residue theorem – The Argument principle – Evaluation of definite integrals, Harmonic functions: The Definitions and basic Properties – Mean value property – Poisson's Formula.

Chapter – 4 (Sec 5.1 – 5.3, 6.1 – 6.3)

Unit IV: **(12 Hrs)**

Series and Product Developments: Weierstrass Theorem – The Taylor Series – The Laurent Series – Partial fractions and Factorization: Partial Fractions – Infinite Products – Canonical Products.

Chapter – 5 (Sec 1.1 – 1.3, 2.1 – 2.3)

Unit V: **(12 Hrs)**

The Riemann Mapping Theorem – Statement and Proff – Boundary Behaviour – Use of the reflection principle – Analytic arcs – Conformal mapping of Polygons: The Behaviour at an angle – The Schwarz – Christoffel Formula – Mapping on a rectangle.

Chapter – 6 (Sec 1.1 – 1.4, 2.1 – 2.3)

TEXT BOOK:

L.V. Ahlfors*, Complex Analysis,* Mc Graw Hill, New York, 2016.

REFERENCE BOOKS:

1. **Walter Rudin,*Real and Complex Analysis,*** McGraw. HiII Book Company.
2. **Tristan neetham, *Visual complex analysis,*** clarentan press, Oxford.
3. **S.Arumugam, A.Thangapandi Issac, A.Somasundaram, *Complex Analysis***, Scitech Publications(India), Pvt.Ltd., Chennai, 2014.
4. **A.R.Vasishtha, Vipin Vasishtha, *Complex Analysis,*** Krishna Prakashan Media, Ltd, 2002.

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M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	17P2MA07	**Title**		
		CORE XIII: ADVANCED REAL ANALYSIS	**Semester**	IV
Hrs/Week	6		**Credits**	04

UNIT-I: **(12 Hrs)**

Double sequences, double series, rearrangement of double series a sufficient condition for equality of iterated

Series,multiplication of series,Casaro Summability,infinite products,Eulers product for reimann zeta function.

UNIT-II: **(12 Hrs)**

Linear Transformation,differentiation,contraction principle,inverse function theorem implicit function theorem.

UNIT-III: **(12 Hrs)**

The rank theorem determinants,derivation of higher order,differentiation of integrals.

UNIT-IV: **(12 Hrs)**

Integration,primitive mapping,partitions of unity, change variable,differential forms

UNIT-V: **(12 Hrs)**

Simplexes and chains,Stoke's theorem, Closed forms and exact forms, vector analysis

TEXT BOOK:

T.M.Apostol Mathematical analysis Narosa Publ. House New Delhi 1985

REFERENCE BOOKS:

WalterRudin Principles of Mathematical Analysis 3rd Edition Mc Graw Hill Book Co.,Kogaskusha 1976

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M.Sc., MATHEMATICS

<table>
<tr><td>Programme code</td><td>M.Sc</td><td>Programme Title</td><td colspan="2">Master of Science (Mathematics)</td></tr>
<tr><td>Course Code</td><td rowspan="2">17P2MA08</td><td>Title</td><td colspan="2" rowspan="2"></td></tr>
<tr><td rowspan="2">Hrs/Week</td><td rowspan="2">6</td><td rowspan="2">CORE VIII: PARTIAL DIFFERENTIAL EQUATONS</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td></td><td></td><td></td><td>Credits</td><td>05</td></tr>
</table>

Unit I **(12 Hrs)**

Mathematical Models: The Classical equation – The vibrating string – The vibrating membrane – Conduction of Heat in solids. Classification of second order equations: Second order equations in two independent variables – Cannonical forms – equations with constant coefficients – general solution.

Chapter 2: Sections 2.2 – 2.5 (omit 2.4), Chapter 3: Sections 3.1 – 3.4

Unit II **(12 Hrs)**

The Cauchy problem: The Cauchy problem – Cauchy – Kowlalewsky theorem – Homogeneous wave equation – Initial – Boundary value problems – Non-homogeneous boundary conditions – Non-homogeneous wave equation, Riemann Method.

Chapter 4: Sections 4.1 – 4.8 (omit 4.6)

Unit III **(18 Hrs)**

Methods of separation of variables: Seperation of variables – The vibrating string problem – Existence and Uniqueness of solution of the vibrating string problem. The heat conduction problem – existence and uniqueness of solution of the heat conduction problem – The laplace and beam equations.

Chapter 6: Sections 6.2 – 6.6

Unit IV **(18 Hrs)**

Boundary value problems: Boundary value problems – Maximum and minimum principles – Uniqueness and continuity theorems – Dirichlet problems for a circle – Dirichlet problems for a circular annulus – Neumann problem for a circle Drirchlet problem for a rectangle – Neumann problem for a rectangle.

Chapter 8: Sections 8.1 – 8.9 (omit 8.8)

Unit V **(18 Hrs)**

Green's function: The delta function – Green's function – method of Green's function – Dirichlet problem for the Laplace operator – method of images – method of eigen functions.

Chapter 10: Sections 10.1 – 10.7 (omit 10.5)

TEXT BOOK:

Tyn Myint. U with Lokenath Debnath, ***Partial Differential Equations for Scientists and Engineers***, 3rd Edition ,2004.

REFERENCE BOOKS:

1. **I.N.Sneddon,** ***Elements of Partial Differential Equations,*** McGraw Hill, London, 1957.

2. **L.C.Evans,** ***Partial Differential Equations***, AMS, Providence, R I, 2003.

3. **Stanley j. Farlow,** ***Partial Differential Equations***, Scientist and Engineers, 1982.

4. **E. C. Zachmanoglou,** ***Introduction to Partial Differential Equation***, 1976.

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M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	**17P3MA09**	**Title**		
		CORE IX :MEASURE THEORY AND INTEGRATION	**Semester**	III
Hrs/Week	7		**Credits**	5

UNIT – I: Lebesgue Measure **(12Hrs)**

Introduction-Outer Measure-Measurable Sets and Lebesgue Measure-Measurable Functions-Littlewood's Three Principles.

Chapter 3 (Sec 1 – 3, 5,6)

UNIT - II : Lebesgue Integral **(12 Hrs)**

The Riemann Integral-the Lebesgue Integral of a Bounded Function over a Set of Finite Measure-the integral of a Nonnegative Function –the General Lebesgue Integral.

Chapter 4 (Sec 1 – 4)

UNIT – III : Differentiation and Integration **(12 Hrs)**

Differentiation of Monotone Functions- Functions of Bounded Variation-Differentiation of an Integral- Absolute continuity.

Chapter 5 (Sec 1 – 4)

Unit – IV :General Measure and Integration **(12 Hrs)**

Measure and Integration- Measure Spaces- Measurable Functions- Integration-Signed measures-the Radon-Nikodym Theroem.

Chapter 11 (Sec 1 – 3, 5,6)

UNIT - V : Measure and Outer Measure **(12 Hrs)**

Out**er** Measure and Measurability-the Extension Theorem-Product Measures.

Chapter 12 (Sec 1, 2,4)

TEXT BOOK :

H. L. Royden, "**Real Analysis"**, 3rd Edition, Prentice Hall of India Private Ltd., New Delhi-110001, 2009.

REFERENCE BOOKS:

1. G.de.Barra, "*Measure Theory and Integration"*, WILEY Eastern Ltd,1981.

2. P.K.Jain and V.P.Gupta, "*Lebesgue Measure and integration"*, New Age INT(P)Ltd., 2000.

3. Walter Rudin,"*Real and Complex Analysi"s*, Tata Mc Graw Hill Publ.Co.Ltd.,1966.

Simmons G.F, "*Topology and Modern Analysis"*, Mc Graw Hill Book Company, 1963.

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M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	17P3MA10	**Title**		
		CORE X: FUNCTIONAL ANALYSIS	**Semester**	III
Hrs/Week	7		**Credits**	5

Unit I: **(12 Hrs)**

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

Chapter 9 (Sec 46 - 48)

Unit II: **(12 Hrs)**

The natural imbedding of N in N** - The open mapping theorem- The conjugate of an operator. Hilbert spaces: The definition and some simple properties.

Chapter 9 (Sec 49 - 51), Chapter 10 (Sec 52)

Unit III: **(12 Hrs)**

Orthogonal complements - Orthonormal sets- The Conjugate space H* - The adjoint of an operator.

Chapter 10 (Sec 53 - 56)

Unit IV: **(12 Hrs)**

Self-adjoint operators – Normal and unitary operators – Projections.

Chapter 10 (Sec 57 - 59)

Unit V: **(12 Hrs)**

Finite dimensional spectral theory: Matrices –The spectral theorem – General preliminaries on Benach's Algebra: The definition and some examples - Regular and singular elements.

Chapter 11 (Sec 60,62), Chapter 12 (Sec 64,65)

TEXT BOOK:

G.F. Simmons, ***Introduction to Topology and Modern Analysis***, TATA McGraw –Hill Book Company, New Delhi, 1963, 5th Reprint 2006.

REFERENCE BOOKS :

1. Dr. D. Somasundaram, ***Functional Analysis,*** S.Viswanathan Pvt.Ltd, 2008.

2. G. Bachman and L. Narici, ***Functional Analysis,*** Academic Press, New York, 2000.

3. H.C. Goffman and G. Fedrick, ***First Course in Functional Analysis,*** Prentice Hall of India, New Delhi, 2000.

4. E. Kreyszig, ***Introductory Functional Analysis with Applications,***John Wiley & Sons, New York, 1978.

5. E.S.Suhubi, ***Functional Analysis,*** Springer International Edition, India, 2009.

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M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	17P3MA11	**Title**		
		CORE PAPER XII: NUMERICAL ANALYSIS	**Semester**	III
Hrs/Week	6		**Credits**	4

Unit I: Solution Of Nonlinear Equations **(12 Hrs)**

Newton's method – Convergence of Newton's method – Bairstow"s Method for quadratic factors. **Numerical Differentiation And Integration:** Derivatives from Differences tables – Higher order derivatives – Divided difference, Central-Difference formulas – Composite formula of Trapezoidal rule – Romberg integration – Simpson's rules.

Chapter 1

Unit II : Solution Of System Of Equations **(12 Hrs)**

The Elimination method – Gauss and Gauss Jordan methods – LU Decomposition method – Matrix inversion by Gauss-Jordan method – Methods of Iteration – Jacobi and Gauss Seidal Iteration – Relaxation method – Systems of Nonlinear equations. Chapter 2

Unit III: Solution Of Ordinary Differential Equations **(12 Hrs)**

Taylor series method – Euler and Modified Euler methods – Rungekutta methods – Multistep methods – Milne's method – Adams Moulton method. Chapter 6

Unit IV: **Boundary Value Problems And Characteristic Value Problems** **(12 Hrs)**

The shooting method – solution through a set of equations – Derivative boundary conditions – Characteristic value problems – Eigen values of a matrix by Iteration – The power method.

Chapter 6

Unit V:Numerical Solution Of Partial Differential Equations **(12 Hrs)**

(Solutions of Elliptic, Parabolic and Hyperbolic partial differential equations) Representation as a difference equation – Laplace's equation on a rectangular region – Iterative methods for Laplace

equation – The Poisson equation – Derivative boundary conditions – Solving the equation for time-dependent heat flow (i) The Explicit method (ii) The Crank Nicolson method – solving the wave equation by Finite Differences.

Chapter 8

TEXT BOOK:

C.F.Gerald and P.O.Wheatley, "*Applied Numerical Analysis"*, Fifth Edition, Addison Wesley, (1998).

REFERENCE BOOKS :

1. **M.K. Venkatraman, "*Numerical Methods in Science and Technology",*** National Publishers Company, 2nd Edition,(1992).
2. **S.C. Chapra and P.C. Raymond, "*Numerical Methods for Engineers",*** tata McGraw Hill, (2000)
3. **P. Kandasamy et al., "*Numerical Methods",***S.Chand & Company Ltd.(2003).

ONLINE SOURCES:

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	17P4MA12	**Title**		
		CORE VII: TOPOLOGY	**Semester**	II
Hrs/Week	6		**Credits**	5

Unit-I: Topological spaces **(12hrs)**

Topological spaces - Basis for a Topology - The order topology - Product topology on XxY- The subspace topology - Closed sets and Limit points.

Chapter – 2 (Sec 12-17)

Unit-II: Continuous Functions **(12 hrs)**

Continuous functions - The product topology - The metric topology.

Chapter – 2 (Sec 18-21)

Unit-III: Connectedness **(12 hrs)**

Connected spaces - Connected subspaces of the real line - Components and local connectedness.

Chapter – 3 (Sec 23-25)

Unit-IV: Compactness **(12 hrs)**

Compact spaces - Compact subspaces of the real line - limit point compactness - local compactness.

Chapter – 3 (Sec 26-29)

Unit-V: Countability and separation axioms **(12 hrs)**

The Countability axioms - The separation axioms - Normal spaces - The Urysohn lemma - The Urysohn metrization theorem - The Tietze extension theorem.

Chapter – 4 Sections 30-35

TEXT BOOK:

James R. Munkres, "***Topology"***, Second Edition, Prentice Hall of India Private Limited, New Delhi, 2014.

REFERENCE BOOKS:

1. **J. Dugundji, "*Topology"***, Allyn and Bacon, 1975.

2. **George F.Simmons**, "***Introduction to Topology and Modern Analysis"***, McGraw Hill 2006.

3. S.**T.Hu**, "***Elements of general topology"***, Holden day,Inc,New York, 1988.

K. Chandrasekara Rao, "***Topology"***, Narosa Publishing House, Pvt., Ltd., 2009.

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ELAYAMPALAYAM, TIRUCHENGODE -637 205.

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	17P4MA13	**Title**		
		CORE XIII: PROBABILITY THEORY	**Semester**	IV
Hrs/Week	6		**Credits**	4

Unit I: **(12 Hrs)**

Random Events and Random variables – Random events – Probability axioms – Combinatorial formulae – Conditional Probability - Bayes Theorem – Independent events – Random variables – Distribution function – Joint Distribution – Marginal Distribution – Conditional Distribution – Problems.

Chapter 1 (Sec 1.1 – 1.7), Chapter 2 (Sec 2.1 – 2.9)

Unit II: **(12 Hrs)**

Parameters of the distribution – Expectation – Moments – The Chebyshev inequality – Absolute moments – Order parameters – Moments of random vectors – Regression of the first and second types.

Chapter 3 (Sec 3.1 – 3.8)

Unit III: **(12 Hrs)**

Characteristic functions – Properties of Characteristic functions - Characteristic functions and moments – Semi-invariants - Characteristic function of the sum of the independent random variables – Determination of distribution function by the characteristic function – Probability generating functions.

Chapter 4 (Sec 4.1 – 4.7)

Unit IV: **(12 Hrs)**

Some probability distributions – One point, two point, Binomial – Polya – Hypergeometric – Poisson (discrete) distributions – Uniform – normal gamma – Beta – Cauchy and Laplace (continuous) distributions.

Chapter 5 (Sec 5.1 – 5.10)

Unit V: **(12 Hrs)**

Limit theorems – Stochastic convergence – Bernoulli Law of Large Numbers – Convergence of sequence of distribution functions – Levy-Crammer Theorem – De Moivre Laplace theorem – Poisson, Chebyshev, Khintchine Weak Law of Large numbers-Problems.

Chapter 6 (Sec 6.1 – 6.4, 6.6 - 6.9, 6.11, 6.12)

TEXT BOOK:

M. Fisz, "*Probability theory and Mathematical Statistics"*, John Wiley and Sons, 1963.

REFERENCE BOOKS:

1. B.R.BHAT " **Modern Probability theory: an introductory** " 4th edition,new age international publisher, 2007.
2. R.B. Ash, "*Real Analysis and Probability"*, Academic Press, 1972.
3. K. L. Chung, "*A course in Probability"*, Academic press, 1974.
4. Y.S.Chow and H. Teicher, "*Probability Theory"*, Springer Verlag, 1988.
5. V. K. Rohatgi, "*An Introduction to Probability Theory and Mathematical Statistics"*, Wiley Eastern
Ltd., 2015.

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	**17P4MA14**	**Title**		
		CORE XIV: NUMBER THEORY	**Semester**	IV
Hrs/Week	6		**Credits**	05

UNIT I: Divisibility **(12 Hrs)**

Introduction - Divisibility-Primes – The Binomial theorem.

Chapter - 1(Sec 1.1. – 1.4)

UNIT II: Congruence's **(12 Hrs)**

Congruence's-Solutions of congruence's – The Chinese remainder theorem – Prime power moduli –

Prime modulus.

Chapter - 2(Sec 2.1. – 2.7)

UNIT III: Quadratic reciprocity **(12 Hrs)**

Quadratic residues - Quadratic reciprocity -The Jacobi symbol – Binary Quadratic forms.

Chapter - 3(Sec 3.1. – 3.4)

UNIT IV: Some functions of Number theory **(12 Hrs)**

Greatest integer function - Arithmetic functions - The Mobius inversion formula- The Recurrence functions.

Chapter – 4 (Sec 4.1. – 4.4)

UNIT V: Some Diaphantine equations and farey fractions **(12 Hrs)**

The equation ax+by= c – farey sequences – Rational approximations – Irrational numbers.

Chapter- 5 (Sec 5.1), Chapter - 6 (Sec 6.1 – 6.3)

TEXT BOOKS :

Ivan Niven and H.S. Zuckerman,*An Introduction to the Theory of Numbers*, 3rd edition, Wiley Eastern Ltd, New Delhi, 1989.

REFERENCE BOOKS:

1. D.M. Burton, ***Elementary Number theory***, Universal Book Stall, New Delhi 2001

2. K. Ireland and M.Rosen, ***A Classical Introduction to Modern Number Theory***, Springer Verlag, New York, 1972.

3. T.M. Apostol, ***Introduction to Analytic Number Theory***, Narosa Publication, House, Chennai, 1980.

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	17P1MAE01	**Title**		
		ELECTIVE I :GRAPH THEORY	**Semester**	I
Hrs/Week	6		**Credits**	5

Unit I: **(12 Hrs)**

Basic Results: Introduction-Basic Concepts-Subgraphs-Degrees of Vertices - Paths and Connectedness - Automorphism of a Simple Graph. Directed Graphs: Introduction-Basic Concepts-Tournaments.

Chapter 1 (Sec 1.1 – 1.6), Chapter 2 (Sec 2.1 – 2.3)

Unit II: **(12 Hrs)**

Connectivity and Trees: Connectivity: Introduction-Vertex cut and Edge Cut-Connectivity and Edge Connectivity. Trees: Introduction-Definition, Characterization and Simple Properties-Centers and Centroids- Cutting the Number of Spanning Trees-Cayley's Formula.

Chapter 3 (Sec 3.1 – 3.3), Chapter 4(4.1 – 4.4)

Unit III: **(12 Hrs)**

Independent Sets, Matchings and Cycles: Independent Sets and Matchings: Introduction-Vertex-Independent Sets and Vertex Coverings-Edge-Independent sets-Matchings and Factors-Matchings in Bipartite Graphs. Cycles: Introduction-Eulerian Graphs - Hamiltonian Graphs.

Chapter 5 (Sec 5.1 – 5.5), Chapter 6(6.1 – 6.3)

Unit IV: **(12 Hrs)**

Graph Colorings: Introduction-Vertex colorings-Critical Graphs-Edge colorings of Graphs-Kirkman's Schoolgirl- Problem-Chromatic Polynomials.

Chapter 7(7.1 – 7.3,7.6,7.8,7.9),

UNIT V: **(12 Hrs)**

Planarity: Introduction- Planar and Nonplanar Graphs –Euler Formula and its Consequences and $K_{3,3}$ are Nonplanar Graphs – Dual of a Plane Graph- The Four-Color Theorem and the Heawood Five- Color Theorem-Hamiltonian Plane Graphs-Tait Coloring.

Chapter 8(8.1 – 8.6,8.8,8.9)

TEXT BOOK:

R.Balakrishnan and K.Ranganathan, "Text Book of Graph Theory", (2nd Edition), Springer, 2012.

REFERENCE BOOKS:

1. **J.A.Bondy and U.S.R. Murty**, "**Graph Theory with Applications"**, 1982.

2. **Narasing Deo,**"**Graph Theory with Application to Engineering and Computer Science"**, Prentice Hall of India, 2003.

3. **F. Harary**, "**Graph Theory"**, Addison – Wesely Pub. Co. The Mass. 1969. 4. L. R.. Foulds, Graph Theory Application, Narosa Publ. House, Chennai, 1933.

4.**K.R.Partha sarathy "Introduction to graph theory",** Prentice Hall of India, 2003.

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	**17P1MAE02**	**Title**		
		ELECTIVE I : CODING THEORY	**Semester**	I
Hrs/Week	6		**Credits**	5

Subject Description:

This course presents the idea of codes.

Goals: To enable the students to learn about linear codes and some good codes.

Objectives: On successful completion of this course the students should have gained knowledgeabout types of coding system, cyclic codes and its some properties.

UNIT – I: Mathematical Background: **(12 Hrs)**

Algebra – Krawtchouk Polynomials – Combinatorial theory-Shannon's Theorem: Introduction -Shannon's Theorem.

UNIT - II : Linear codes: **(12 Hrs)**

Block codes – Linear codes – Hamming codes - Majority logic decoding – Weight Enumerators – The Lee metric.

UNIT – III : Some good codes: **(12 Hrs)**

Hadamard codes and generalizations – The binary Golay code – The ternary Golay code-Constructing codes from other codes - Reed-Muller code – Kerdockcodes.

Unit – IV : Bound on codes: **(12 Hrs)**

The Gilbert bound – Upper bounds – Cyclic codes: Definitions- Generator matrix and checkpolynomial – Zeros of a cyclic code.

UNIT - V : **(12 Hrs)**

The idempotent of a cyclic code – Other Representations of cyclic codes – BCH codes – Decoding BCH codes- Binary cyclic codes of length 2n (n odd).

TOTAL : **(60 Hours)**

TEXT BOOK :

Introduction to Coding Theory by J. H. Van Lint

REFERENCE BOOKS:

1. **A first course in coding theory by Raymond Hill**
2. **Coding and Information Theory by Steven Roman**

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	**17P2MAE03**	**Title**		
		ELECTIVE III: MATHEMATICAL METHODS	**Semester**	II
Hrs/Week	6		**Credits**	05

UNIT – I: Variational problems with fixed boundaries (12 Hrs)

The concept of variation and its properties- Euler's equation- Variational problems for Functionals- Functionals dependent on higher order derivatives – Functions of several independent variables – Some applications to problems of Mechanics. Chapter- 1 (Sec 1.1- 1.7)

UNIT – II : Variational problems with moving boundaries (12 Hrs)

Movable boundary for a functional dependent on two functions – one-side variations – Reflection and Refraction of extermals – Diffraction of light rays. Chapter – 2 (Sec 2.1 – 2.5)

UNIT – III :Integral Equation (12 Hrs)

Introduction – Types of Kernels – Eigen Values and Eigen Functions – Connection with differential equation – Solution of an integral equation – Initial value problems – Boundary value problems. Chapter – 1(Sec 1.1 – 1.3 & 1.5 – 1.8)

UNIT – IV : Solution of Fredholm integral equation (12 Hrs)

Second kind with separable kernel – Orthogonality and reality eigen function - Fredholm integral equation with separable kernel - Solution of Fredholm integral equation by successive substitution – Successive approximation – Volterra integral equation - Solution of successive substitution .

Chapter – 2 (Sec 2.1 – 2.3), Chapter – 4 (Sec 4.1 – 4.5)

UNIT – V : Hilbert – Schmidt Theory (12 Hrs)

Complex Hilbert Space – Orthogonal system of functions – Gram Schmit orthogonlization process - Hilbert – Schmidt Theorem - Solution of Fredholm integral equation of first kind.

Chapter – 3(Sec 3.1 – 3.4 , 3.8 – 3.9

TEXT BOOKS:

1. **A.S. Gupta,** ***Calculus of Variations with Application,*** Prentice Hall of India, New Delhi, 2005.

2. **Sudir K.Pundir and Rimple Pundir**, ***Integral Equations and Boundary Value Problems,*** Pragati Prakasam, Meerut, 2005.

REFERENCE BOOKS:

1. F.B.Hildebrand, ***Methods of Applied Mathematics***, Prentice Hall of India Pvt. New Delhi, 1968.

2. R.P.Kanwal, ***Linear Integral Equations-Theory and Techniques***, Academic Press, New York, 1971.

3. L.Elsgolts, ***Differential Equations and Calculus of Variations***, Mir Publishers, Moscow, 1973.

Sadri Hassani, ***Mathematical Methods***, pub 2009.

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	**17P2MAE04**	**Title**		
		ELECTIVE PAPER IV: NEURAL NETWORKS	**Semester**	I
Hrs/Week	6		**Credits**	04

Subject Description:

This course presents the idea of neutron network models**.**

Goals:

To enable the students to learn about algorithms for multilayerperceptions, radial-basis function networks.

Objectives:

On successful completion of this course the students should have gained knowledge about back propagation algorithm, directional derivatives and necessary conditions for optimality and to evaluate quadratic functions.

Unit: I **(12 Hrs)**

Neuron Model and Network Architectures

Mathematical Neuron Model- Network Architectures- Perceptron-Hamming Network-HopfieldNetwork-Learning Rules.

Unit :II

Perceptron Architecture **(12 Hrs)**

Perceptron Architectures and Learning Rule with Proof of Convergence. Supervised HebbianLearning -Linear Associator.

Unit :III

Supervised Hebbian Learning **(12 Hrs)**

The Hebb Rule-Pseudo inverse Rule-Variations of Hebbian Learning-Back Propagation - MultilayerPerceptrons.

Unit :IV

Back Propagation **(12 Hrs)**

Back propagation Algorithm-Convergence and Generalization - Performances Surfaces and Optimum Points-Taylor series.

Unit :V **(12 Hrs)**

Performance Surfaces and Performance Optimizations

Directional Derivatives - Minima-Necessary Conditions for Optimality-Quadratic Functions- Performance Optimizations-Steepest Descent-Newton's Method-Conjugate Gradient.

TOTAL : **60 Hours**

Power point Presentations, Seminar ,Quiz, Assignment

TEXT BOOK:

1 Martin T. Hagan, Howard B. Demuth and Mark Beale, Neural Network Design, VikasPublishingHouse, New Delhi,2002.

REFERENCE BOOKS :

1. James A. Freeman, David M. Skapura, Neural Networks Algorithms, Applications andProgrammingTechniques, Pearson Education, 2003.

2. Robert J. Schalkoff, Artificial Neural Network, McGraw-Hill International Edition, 1997.

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	17P3MAE05	**Title**		
		CORE BASED ELECTIVE V: OPTIMIZATION TECHNIQUES	**Semester**	III
Hrs/Week	6		**Credits**	4

Unit I: Duality Linear Programming (12 Hrs)

General Primal-Dual – Formulating a Dual problem – Duality and Simplex Method – DualSimplex Method.

Chapter 4 (Sec 4.1 – 4.3)

Unit II: Decision analysis and games (12 Hrs)

Decision environment – Decision making under certainty (Analytical Hierarchy approach) Decision making under risk – Expected value criterion – Variations of the expected value criterion –Decision under uncertainty - Game theory – optimal solution of two – Person Zero – Sum games – Solution of mixed strategygames.

Chapter 13 (Sec 13.1 – 13.4)

Unit III: Simulation modeling (12 Hrs)

What is simulation – Monte Carlo simulation – Types of simulation – Elements of discrete event simulation – Generic definition of events – Sampling from probability distributions -Methods for gathering statistical observations – Sub interval method – Replication method – Regenerative (Cycle) method – Simulation languages.

Chapter 16 (Sec 16.1 – 16.7)

Unit IV: Nonlinear Programming Problem (12 Hrs)

Formulation – General NLPP – Constrained optimization with equality constraints -Constrained optimization with inequality constraints.

Chapter 27 (Sec 27.1 – 27.7)

Unit V: Nonlinear programming Methods (12 Hrs)

Graphical solution – Khun-Tucker Conditions with non-negative constraints - Quadraticprogramming – Wolfe's method - Separable convex programming - Geometric programming.

Chapter 28 (Sec 28.1 – 28.5, 28.8), Chapter 29 (Sec 29.1 – 29.4)

TEXT BOOK:

1. H.A. Taha, "*Operation Research an Introduction",* Prentice Hall India**,** 2003.**(Unit I , II , & III)**

2. Kanti swarup, P.K. Gupta and Man Mohan , "*Operations Research",* Sultan Chand & Sons,2015. **(Unit IV & V)**

REFERENCE BOOKS:

1. F.S. Hillier and G.J. Lieberman, "*Introduction to Operation Research",*

Mc Graw Hill Book Company, 1989.

2. Philips D.T.Ravindra A. and J. Solbery,"***Operations Research", Principles and Practice,*** John Wiley and Sons, New York.

3. B.E.Gillett, ***Operations research – A Computer Oriented Algorithmic Approach,***TMH Edition, New Delhi, 1976.

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	**17P3MAE06**	**Title**		
		CORE BASED ELECTIVE VI: CONTROL THEORY	**Semester**	III
Hrs/Week	5		**Credits**	4

Subject Description:

This course presents the idea of Controllability.

Goals:

To enable the students to learn about observability, controllability and stabilizabilization.

Objectives:

On successful completion of this course the students should have gained

knowledge aboutlinear, nonlinear system, perturbed linearsystem, controllable

subspace, and stabilization.

UNIT – I: Observability **(12 Hrs)**

Linear Systems – Observability Grammian – Constant coefficient systems – Reconstructionkernel – Nonlinear Systems.

UNIT - II : Controllability **(12 Hrs)**

Linear systems – Controllability Grammian – Adjoint systems – Constant coefficient systems –steering function – Nonlinear systems.

UNIT – III : Stability **(12Hrs)**

Stability – Uniform Stability – Asymptotic Stability of Linear Systems.

Unit – IV : Perturbed Linear Systems **(12Hrs)**

Linear time varying systems – Perturbed linear systems – Nonlinear systems.

UNIT - V : Stabilizability **(12Hrs)**

Stabilization via linear feedback control – Bass method – Controllable subspace –Stabilizationwith restricted feedback.

TOTAL : **(60 Hours)**

TEXT BOOK :

K. Balachandran and J. P. Dauer, Elements of Control Theory, Narosa, New Delhi, 1999.

REFERENCE BOOKS:

1. R. Conti, Linear Differential Equations and Control, Academic Press, London, 1976.
2. R. F. Curtain and A. J. Pritchard, Functional Analysis and Modern Applied Mathematics,Academic Press, New York, 1977.
3. J. Klamka, Controllability of Dynamical Systems, Kluwer Academic Publisher, Dordrecht,1991.
4. D. L. Russell, Mathematics of Finite Dimensional Control Systems, Marcel Dekker, NewYork, 1979.
5. E. B. Lee and L. Markus, Foundations of optimal Control Theory, John Wiley, New York,1967.

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	17P4MAE07	**Title**		
		ELECTIVE VII:	**Semester**	IV
Hrs/Week	6	**DIFFERENTIAL GEOMETRY**	**Credits**	4

Unit: I **(12 Hrs)**

Theory of Space Curves: Introduction – Representation of space curves –Unique parametric representation of a space curve –Arc length – Tangent and osculating plane –Principle normal andbinormal– Curvature and torsion – The curvature and torsion of a curve as the intersection of two surfaces.

Chapter I (Sec 1.1 - 1.7,1.9)

Unit :II **(12 Hrs)**

Theory of Space Curves (Contd): Contact between curves and surfaces-Osculating circle andosculating sphere –Locus of centres of spherical curvature – Tangent surfaces – Involutes and Evolutes – Intrinsic equationsof space curves – Fundamental Existence theorem for space curves.

Chapter I (Sec 1.10 - 1.13 ,1.16 - 1.17)

Unit :III **(12 Hrs)**

The first fundamental form and Local Intrinsic properties of a surface: Introduction - Definition of a surface – Nature of points on a surface – Representation of a surface – Curves onsurfaces – Tangent plane and surface normal – The general surfaces of revolution – Helicoids – Metric on a surface – The first fundamental form - Direction coefficients on a surface.

Chapter II (Sec 2.1 - 2.10)

Unit :IV **(12 Hrs)**

The first fundamental form and Local Intrinsic properties of a surface (Contd) and geodesicon a surface:Families of curves – Orthogonal trajectories – Double family of curves – Isometric correspondence – Intrinsic properties – Introduction - Geodesics and their differential equations – Canonical Geodesic equations.

Chapter II (Sec 2.11 - 2.15) , Chapter III (Sec 3.1 - 3.3)

Unit :V **(12 Hrs)**

Geodesic on a surface: Normal property of Geodesics – Differential equations of geodesics using normal property – Existence theorems – Geodesics parallels – Geodesic curvature – Gauss Bonnet Theorems – Gaussian curvature.Chapter III (Sec 3.5 - 3.8, 3.10- 3.12)

TEXT BOOK:

1. **D. Somasundaram,** ***Differential Geometry***, Narosa Publ.House, Chennai-2006.

REFERENCE BOOKS :

1. **T.Wilmore,*****An Introduction to Differential Geometry,*** Clarendan Press,Oxford,2015.

2. **D.T. Struik,*****Lectures on classical Differential Geometry,*** Addison-Wesely,Mass 2006

3. **J.A. Thorpe,*****Elementary Topics in Differential Geometry,*** Springer-Verlag, NewYork,1979.

4. **Erwin Kreyszig,*****Differential Geometry, Dover publications,*** INC, New York 2000

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	**17P4MAE08**	**Title**		
		GROUP D: ELECTIVE IV: CRYPTOGRAPHY	**Semester**	IV
Hrs/Week	6		**Credits**	4

Subject Description:

This course presents the idea of Cryptography.

Goals: To enable the students to learn about cryptographicalgorithms.

Objectives: On successful completion of this course the students should have gained knowledgeabout security mechanisms in the theory of networks.

Unit: I **(12 Hrs)**

Introduction – Encryption and Secrecy – The objective of Cryptography - Number Theory –Introduction – Modular Arithmetic.

Unit :II **(12 Hrs)**

Integer factorization problem – Pollard's rho factoring – Elliptic curve factoring – Discretelogarithm problem.

Unit :III **(12 Hrs)**

Finite fields – Basic properties – Arithmetic of polynomials –Factoring polynomials over finitefields –Square free factorization.

Unit :IV **(12 Hrs)**

Symmetric key encryption – Stream ciphers – Block Ciphers – DES.

Unit :V **(12 Hrs)**

Public key cryptography – Concepts of public key cryptography – Modular arithmetic – RSA –Discrete logarithm – Elliptic curve cryptography.

TOTAL : **60 Hours**

TEXT BOOK:

1. Hans Delfs, Helmut Knebl, Introduction to Cryptography, Springer Verlag, 2002.
2. Alfred J. Menezes, Paul C. Van Oorschot, Scott A. Vanstone, Handbook of AppliedCryptography, CRC Press, 2000.
3. William Stallings, Cryptography and Network Security, Prentice Hall of India, 2000.

REFERENCE BOOKS :

1 Cryptography and Information Security, Pachghare V.K., PHI Learning Pvt. Ltd., NewDelhi,2009

2. Cryptography and Network Security, Behrouz A. Forouzan and Debdeep Mukhopathyey,2013,second edition, Mc Graw Hill Education Pvt. Ltd., New Delhi.

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Programme code	M.Sc	**Programme Title**	**Master of Science (Mathematics)**	
Course Code	**17P4MAPR01**	**Title**		
		PROJECT	**Semester**	IV
Hrs/Week	6		**Credits**	4

Topic:

The Topic of the dissertation shall be assigned to the candidate before the beginning of third semester and a copy of the same should be submitted to the examination to approval.

No. of Copies Project/Dissertation:

The students should prepare three copies of dissertation and submit the same for the evaluation by examiners.After evaluation one copy is to be retained in the college library and one copy is to be submitted to the COE cell and one copy can be held by the student.

Format to be followed:

The formats/certificates for project/dissertation to be submitted to the students is given below:

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a) Title page

b) Bonafide certificate

c) Acknowledgement

d) Table of contents

CONTENTS

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MATHEMATICS

By

Student's Name :

Register Number :

College :

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This is to certify that the dissertation entitled.....submitted in partial fulfillment of the requirement of the degree of Master of Science in MATHEMATICS,is a record of bonafide research work carried out by..... under my supervision and guidance and that no part of the dissertation has been submitted for the award of any degree ,diploma,fellowship or other similar titles or prizes and that the work has not been published in part or full in any scientific or popular journals or magazines.

Signature of the Guide

Date:

Place:

Signature of the Head of the Department