HAJEE KARUTHA ROWTHER HOWDIA COLLEGE (AUTONOMOUS)
UTHAMAPALAYAM

Choice Based Credit System

M.Sc., Mathematics(Semester)

Course Scheme & Scheme Of Examinations

(Effective from the academic year 2014 – 2015 onwards)

Qualification :Passed B.Sc. in mathematics or any degree accepted by the syndicate as equivalent

Duration of the Course :M.Sc., **., Mathematics** - Two academic years years (4 – Semesters)

OBJECTIVES OF THE COURSE :

1. To enable the students to understand the knowledge of Mathematics.
2. To acquire skills in the field of life oriented, application oriented and job oriented Mathematics.
3. Study of non major subject can develop skills in the various field. which will enable the students to get a job.
4. Visit to various industries and other government department by the student will create a sound knowledge in the field of Applied Mathematics

SUBJECTS OF STUDY :

1) Core Subjects – Mathematics.
2) Allied Subjects_ Mathematics

STRUCTURE OF THE QUESTION PAPERS:

Internal : 25 marks

External : 75 marks

Total :100 marks

Question Paper: Three Parts A, B and C

Section – A (multiple choice, True or False)

Section - B (either A or B)

Section – C (3 out 5 questions)

COURSE CONTENT

Semester	Title of the Paper	Code	credits	Hours/ week	Marks allotted		
					Int	Ext	Total
I	Core I- Algebra- I	14PMAC11	5	6	25	75	100
	Core II -Analysis -I	14PMAC12	5	6	25	75	100
	Core III – Ordinary Differential Equations	14PMAC13	4	6	25	75	100
	Core IV - Graph Theory	14PMAC14	4	6	25	75	100
	Elective I – Mechanics/ /Analysis Of Algorithms	14PMAE11	4	6	25	75	100
II	Core V- Algebra -II	14PMAC21	5	6	25	75	100
	Core VI - Analysis -II	14PMAC22	5	6	25	75	100
	Core VII -Differential Geometry	14PMAC23	5	6	25	75	100
	Core VIII - Numerical Analysis	14PMAC24	4	6	25	75	100
	Elective II - Combinatorial Mathematics.	14PMAE21	4	6	25	75	100
III	Core IX-Algebra- III	14PMAC31	5	6	25	75	100
	Core X -Analysis -III	14PMAC32	5	6	25	75	100
	Core XI- Topology	14PMAC33	4	6	25	75	100
	Core XII- Statistics	14PMAC34	4	6	25	75	100
	NME-Mathematics for competitive Examination	14PMAE31	4	6	25	75	100
IV	CoreXIII- Complex Analysis	14PMAC41	5	6	25	75	100
	Core XIV- Number Theory	14PMAC42	5	6	25	75	100
	Core XV - Functional Analysis	14PMAC43	5	6	25	75	100
	Core XVI - Operations Research	14PMAC44	4	6	25	75	100
	Elective IV -Advanced Functional analysis	14PMAE41	4	6	25	75	100

Core – I

14PMAC11	ALGEBRA I	Hours 6 / credits 5

UNIT – I

Another Counting Principle, Sylow's Theorem, (Sections 2.11,2.12)

UNIT – II

Direct Products, Finite abelian groups (Section 2.13, 2.14)

UNIT – III

Ideals and Quotient Rings, More ideals and Quotient Rings. The field of Quotients of an integral Domain (sections 3.4, 3.5, 3.6)

UNIT – IV

Euclidean Rings, A particular Euclidean Rings (sections 3.7, 3.8)

UNIT – V

Polynomial Rings, Polynomials over the rational field, Polynomial over commutative Rings, (Sections 3.9, 3.10, 3.11)

TEXT BOOK

Topics in Algebra by I.N. Herstein, second Edition, John Wiley and sons, 1999.

Core – II

14PMAC12	ANALYSIS I	Hours 6 / credits 5

UNIT – I

Finite, Countable and Uncountable sets, Metric Spaces (Sec 2.1 to 2.30)

UNIT – II

Compact Sets, Perfect sets, Connected sets (sec 2.31 to 2.47 and 3.1 to 3.20)

UNIT – III

Series, Series of Non-negative terms, The number e, The Roots and ratio tests Power Series, Summation by Parts, Absolute, convergence, Addition and Multiplication of series, (Sec 3.21 to 3.54)

UNIT – IV

Limits of Functions, Continuous functions continuity and connectedness, Discontinuities, monotonic Functions, Infinite Limits and limits at Infinity (Sec 4.1 to 4.34)

UNIT – V

The derivative of a real function, Mean Value theorems, the continuity of derivatives, 'Hospital's rule, Derivatives of Higher Order, Taylor's theorem, (Sec 5.1 to 5.18)

TEXT

Principles of Mathematical Analysis by Walter Rudin.

REFERENCE:

Analysis by Prof. V. Karunakara

Core – III

14PMAC13	ORDINARY DIFFERENTIAL EQUATIONS	Hours 6 / credits 4

UNIT – I

Second order homogeneous equation, Initial Value problems, Linear dependence and independence, Wronskian and a formula for Wronskian, Non-homogeneous equation of order two. (Chapter 2: Sec 1 to 6)

UNIT –I I

Homogeneous and Non-Homogeneous of order n, Initial Value problems, Annihilator method to solve Non-Homogeneous equation , Algebra of constant coefficient operators. (Chapter 2: Sec 7 to 12)

UNIT – III

Introduction, Initial Value problems for the homogeneous equation, solutions of the homogeneous equation, Wronskian and linear independence, Reduction of the order of a homogeneous equation, The Non - Homogeneous equation ,homogeneous equation with analytic coefficients, The Legendre equation.(Chapter 3: Section 1 to 8).

UNIT – IV

Introduction, the Euler equation, second order equations with regular singular points – an example, second order equations with regular singular points – the general case, A convergence proof, the exceptional cases, the Bessel equation, the Bessels equations(continued) (Chapter 4, Section 1 to 8).

UNIT –V

Introduction,Equations with variable separated, Exact equations, the method of successive approximations, the Lipschitz condition, convergence of the successive approximations, non-local existence of solutions, approximations to and uniqueness of solutions (Chapter 5, Section 1 to 8).

TEXT BOOK:

An introduction to ordinary differential equations by E.A. Coddington

Core –IV

14PMAC14	GRAPH THEORY	Hours 6 / credits

UNIT – I

Graphs and simple graphs, Graph isomorphism, The incidence and adjacency matrices, sub graphs, vertex degrees, Paths and connection, Cycles, The Shortest path problem, Sperners lemma.(Chapter 1)

UNIT – II

Trees, Cut edges and Bonds, Cut vertices,Cayleys formula, The Connecter Problem, Connectivity,Blocks, Construction of Reliable Communication Networks..(Chapter 2 and 3)

UNIT – III

Euler tours, Hamiltonian cycles ,The Chinese postman problem, The travelling salesman problem(Chapter 4)

UNIT-IV

Matchings, Matchings and coverings in Bipartite graphs, Perfect matching, The personnel assignment problem,The optimal assignment problem(Chapter 5).

UNIT-V

Edge Chromatic number, Vizing`s theorem, The timetabling problem

(Chapter 6)

Text Book:

Graph Theory with Applications,J.A.Bondy and U.S.R.Murty

Chapters:1,2,3,4,5 and 6

ELECTIVE- I

14PMAE11	MECHANICS	Hours 6 / credits 3

UNIT – I

Mechanics of a particle, Mechanics of a system of Particles, constraints (Chapter 1, Section 1.1 to 1.3).

UNIT – II

D' Alembert's Principle and lagrange's equations, velocity – dependent potentials and the dissipation function, Hamilton's principle, some techniques of the calculus of variations, (Chapter 1, Section 1.4, 1.5 and Chapter 2, Section 2.1 to 2.2).

UNIT – III

Derivation of Lagrange's equation from Hamilton's principle, Extension of Hamilton's principle to nonholonomic systems, advantage of a variational principle formulation conservation theorems and symmetry properties. (Chapter 2, Section 2.3 to 2.6).

UNIT – IV

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 (Chapter 3, Section 3.1 to 3.4).

UNIT – V

The Differential equation for the orbit and integral power – law potentials, 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 – Rungelenz vector. (Chapter 3, Section 3.5 to 3.9).

REFERENCE BOOKS:

Classical Mechanics by H. Goldstein, second Edition, Addison Wesley New York, 1980.

SEMESTER II

CORE V

14PMAC21	ALGEBRA II	Hours 6 / credits 5

UNIT – I

Dual spaces, Inner product spaces (Chapter 4, Section 4.3, to 4.4).

UNIT – II

Modules, the algebra of linear transformation, characteristic roots, matrices. (Chapter 4, Section 4.5, and Chapter 6, Section 6.1, 6.2, and 6.3).

UNIT – III

Canonical forms, Triangular form, Nilpotent transformations, A decomposition of V: Jordan form (Chapter 6, Section 6.4, 6.5 and 6.6).

UNIT – IV

Canonical forms, Rational canonical form, Trace and Transpose. (Chapter 6, Section 6.7, and 6.8).

UNIT – V

Determinants, hermitian, Unitary and Normal Transformations, Real Quadratic forms. (Chapter 6, Section 6.9 and 6.10).

TEXT BOOK:

Topics in Algebra by I.N. Herstein (2^{nd} Edition) John Wiley and sons, 1999.

CORE VI

14PMAC22	ANALYSIS II	Hours 6 / credits 5

UNIT – I

Definitions and existence of the Integral, Properties of the Integral, Integration and Differentiation, Integration of vector valued functions. Rectifiable curves. (Chapter 6, Section 6.1,to 6.27).

UNIT – II

Discussion of the main Problem, Uniform convergence and continuity, uniform convergence and integration, Uniform convergence and Differentiation, equi continuous families of functions, The stone – Weierstrass Theorem (Chapter 7, Section 7.1 to 7.33).

UNIT – III

Power series, the exponential and logarithmic functions, the trigonometric functions, the algebraic completeness of the complex field, Fourier series, the gamma function (Chapter 8, Section 8.1 to 8.22).

UNIT – IV

Linear transformation – Differentiation – The contraction principle – the inverse function theorem (Chapter 9, relevant sections).

UNIT – V

The implicit function theorem – the rank theorem – determinants – derivatives of higher order – differentiation of integrals (Chapter 9, relevant sections).

TEXT BOOK:

Principles of Mathematical Analysis by Walter Rudin, Third Edition McGraw Hill.

CORE-VII

14PMAC23	DIFFERENTIAL GEOMETRY	Hours 6 / credits 4

UNIT – I

Introductory remarks about space curves, Definition, Arc Length, Tangent, normal and binomial curvature and torsion of a curve given as the intersection of two surfaces, contact between curves and surfaces, Tangent surfaces, involutes and evolutes (Chapter 1, Section 1 to 7)

UNIT – II

Intrinsic equations, fundamental existance theorem for space curves, Helices and definition of a surface, curves on a surface, surfaces of revolution Helicoids (Chapter 2 Section 1 to 4) Chapter 1, Section 8,9)

UNIT – III

Metric, Direction coefficients, Families of curves, Isometric correspondance, Intrinsic properties, Geodesics, canonical geodesic equations, Normal Property of geodesics (Chapter 2, section 5 to12).

UNIT – IV

Geodesics curvature, Gauss – Bonnet theorem, Gaussian curvature, Surfaces of constant curvature (Chapter 2, section 14 to16).

UNIT – V

The second fundamental form, Principal curvatures, lines of curvature, developables, Developables associated with space curves Developable associated with curves on surfaces, Minimal surfaces, Ruled surfaces. (Chapter 3, section 1 to7).

TEXT BOOK:

An introduction to Differential Geometry by T.G. Willmore, Oxford University press

CORE VIII

14PMAC24	NUMERICAL ANALYSIS	Hours 6 / credits 4

UNIT – I

Introduction, Bisection Method, iteration method, based on first degree equation, iteration methods based on second degree equation, rate of convergence, General Iteration. (Chapter 2, Section 2.1 to 2.6, and 2.8 to 2.9)

UNIT – II

Introduction, Direct Methods, Iteration methods, Eigen values and eigen vectors, (Chapter 3, Section 3.1 ,3.2, 3.4 to 3.6)

UNIT – III

Introduction, Numerical Differentiation, Finite difference operators, Interpolating Polynomials using finite difference, Hermite interpolation, Piecewise and spline interpolation. (Chapter 4, Section 4.1 to 4.6)

UNIT – IV

Introduction, Numerical differentiation. Extrapolation methods, partial differentiation, Numerical integration, Methods based on interpolation, composite integration Methods,. (Chapter 5, Section 5.1, 5.2 to 5.7)

UNIT – V

Introduction, Difference equation, Numerical methods, single step methods, multi step methods (Chapter 6, Section 6.1 to 6.4)

TEXT BOOK:

Numerical methods for scientific and Engineering computation M.K. Jain, S.R.K. Iyengar and R.K. Jain, Fourth Edition; New Age International Publishers, 2003.

ELECTIVE - II

14PMAE21	COMBINATORIAL MATHEMATICS	Hours 6 / credits 4

UNIT – I

Introduction – the rules of sum and product – permutations – combinations – distribution of distinct objects – distributions of non – distinct objects (Chapter 1, Section 1.1 to 1.6).

UNIT – II

Introduction – Generating functions for combinations – Enumerators for permutation – distributions of distinct objects into non – distinct cells – partitions of integer – elementary relations. (Chapter 2, Section 2.1 to 2.5 and 2.7).

UNIT – III

Introduction – Linear recurrence relations with constant coefficients – solution by the technique of generating functions – recurrence relations with two indices (Chapter 3, Section 3.1 to 3.3 and 3.5).

UNIT – IV

Introduction – the Principle of inclusion and exclusion – the general formula – derangements – permutations with restrictions on relative positions.

UNIT – V

Introduction – Equivalence classes under permutation group – equivalence classes of functions – weight and inventories of functions – polya's fundamental theorem – generalizations of polya's theorem (Chapter 5, Section 5.1 5.3 to 5.7).

TEXT BOOK:

Introduction to combinatorial Mathematics by C.T. Liu, McGraw Hill, 1968

CORE: IX

14PMAC31	ALGEBRA-III	Hours 6 / credits 5

UNIT – I

Extension fields, the transcendence of e (Chapter 5, Sec 5.1, 5.2)

UNIT – II

Roots of Polynomials, construction with straightedge and compass, more about roots (Chapter 5, Sec 5.3, 5.4 and 5.5).

UNIT – III

The elements of Galois Theory solvability by Radicals. (Chapter 5, Sec 5.6, 5.7).

UNIT – IV

Galois group over the rationals, finite fields (Chapter 5, Sec 5.8 and Chapter 7, Section 7.1).

UNIT – V

Wedderburn's theorem on finite division rings (Chapter 7, Sec 7.2).

TEXT BOOK:

Topics in Algebra by I.N. Herstein, Second Edition,

John Wiley and sons, 1999.

CORE – X

14PMAC32	ANALYSIS-III	Hours 6 / credits 5

UNIT – I

Lebesgue outer measure – Measurable sets – regularity.

UNIT – II

Measurable functions – Borel and Lebesgue measurability.

UNIT – III

Integration of non – negative functions – the general integral – integration of series.

UNIT – IV

Riemann and Lebesgue integrals – the four derivatives – continuous non – differentiable functions.

UNIT – V

Functions of bounded variations – Lebesgue differentiation Theorem – differentiation and integration – the lebesgue set.

TEXT BOOK:

Measure Theory and Integration –

G.de Barra, Willey Eastern Ltd. (2^{nd} Edition) Chapter 2,3,4)

CORE XI

14PMAC33	TOPOLOGY	Hours 6 / credits 5

UNIT – I

Topological spaces – Basis for a topology – the order topology – the product topology on XxY. The sub space topology – closed sets and Limit Points – continuous functions – the Product topology.

UNIT – II

The Metric topology – connected spaces – connected spaces on a real line.

UNIT – III

Compact spaces – compact sub spaces of the real line – Limit Point compactness – Local compactness.

UNIT – IV

Countability axioms – the separation axioms – normal spaces.

UNIT – V

The urysohn Lemma – the Urysohn metrization theorem – Tietze extension theorem – the tychonoff theorem.

TEXT BOOK:

Topology (2^{nd} Edition) James R. Munkres, Prentice – Hall of India Private Ltd., New Delhi.

CORE XII

14PMAC34	STATISTICS	Hours 6 / credits 5

UNIT – I

Introduction, set theory, the probability set function, conditional probability and Independence, Random variables of the discrete type, random variables of the continuous type, properties of the distribution function, Expectation of a random variable, some special expectations, chebyshev's inequality. (Chapter 1, Section 1.1 to 10).

UNIT – II

Distributions of two random variables, conditional distributions and expectations. The correlation co-efficient, Independent random variables. Extension to several random variables. (Chapter 2, Section 2.1 to 2.5).

UNIT – III

The binomial and related distributions, the poisson distribution, the Gamma and Chi-square distributions, the normal distributions, the Bivariate normal distributions. (Chapter 3, Section 3.1 to 3.5).

UNIT – IV

Sampling Theory, transformations of variables of the discrete type, transformations of variables of the continuous type, the Beta E, F distributions, Extensions of the change of Variable technique, the moment generating function technique, the distributions of X, and ns2/2, Expectations of functions of random variables (Chapter 4, Section 4.1 to 4.9).

UNIT – V

Convergence of distribution, convergence of probability, limiting moment generating functions, the central limit theorem, some theorems of limiting distributions. (Chapter 5, Section 5.1 to 5.5).

TEXT BOOK:

Introduction to Mathematical statistics, 5^{th} Edition by R.V. Hogg and A.T. Craig, Pearson Education, Asia 2002.

NON-MAJOR ELECTIVE

14PMAN31	MATHEMATICS FOR COMPETITIVE EXAMINATIONS	Hours 6 / credits 4

Unit-I

H.C.F. and L.C.M of numbers – decimal – fractions – simplifications – average – problems on numbers – problems on ages.

Unit-II

Percentage – profit and loss- ratio and proportion partnership – simple interest and compound interest.

Unit-III

Time and work – Time and distance – problems on trans – Allegation of mixture.

Unit – IV

Stocks and shares – Calendar –clocks –odd man out and series.

Unit-V

Verbal and non-verbal reasoning.

TEXT BOOK:

1. Quantitative Aptitude, by R.S.Agarwal,Publishers: S.Chand and Co.
2. Verbal and non-verbal reasoning**, by A.S.Agarwal, Publishers:S.Chand and Com.,**

SEMESTER- IV

CORE XIII

14PMAC41	COMPLEX ANALYSIS	Hours 6 / credits 5

UNIT – I

The Algebra of complex numbers. The Geometric representation of complex numbers. (Chapter 1, Section 1,2).

UNIT – II

Introduction to the concept of Analytic function, Elementary theory of Power series, the exponential and Trigonometric functions. (Chapter 2, Section 1,2,3).

UNIT – III

Elementary Point set Topology – conformality, Linear transformations, elementary conformal mappings (Chapter 3, Section 1,2,3,4).

UNIT – IV

Fundamental Theorems, Cauchy's integral formula. Local properties of analytical functions (Chapter 4, Section 1,2,3).

UNIT – V

The general form of cauchy's theorem. The Calculus of residues, Harmonic functions, Power series expansions. (Chapter 4, Section 4,5,6, Chapter 5, Section 1).

TEXT BOOK:

Complex Analysis by L.V. Ahlfors (3rd Edition) McGraw Hill ISE, 1981

CORE XIV

14PMAC42	NUMBER THEORY	Hours 6 / credits 5

UNIT – I

Introduction, divisibility, Greatest Common divisor, prime numbers, the fundamental theorem of arithmetic. The series of reciprocals of the primes. The Euclidean algorithm, the GCD of more than two numbers, the Mobius function, the euler totient function, a relation connecting n and D, A Product formula for (n). The dirichlet product of arithmetical functions, Dirichlet inverses and the Mobius inversion formula, the Mangoldt function, Multiplicative functions, Multiplicative functions and Dirichlet multiplication, the inverse of a completely multiplicative functions. (Chap. 1, Sec. 1.1 to 1.8, Chap. 2, Sec. 2.1 to 2.11).

UNIT – II

Liouville's functions, the divisor function. The Bell serried of an arithmetical function generalized convolutions, Formal Power series. The bell series and dirichlet multiplication. Derivatives of arithmetic funds. The selberg identity, big oh notation, Asymptotic equality of functions Euler's animation formula, some elementary asymptotic formulas. The average order d(n), the average order of the division functions (n). An application of to the distribution of lattice points visible from the origin, the average order of D9n) and of (n), the partial sums of a Dilichlet product. Application to D9n) and (n), another identy for the partial sums of a Dirichlet product. (Chapter 2, Section 2.12 to 2.19 and Chaprter 3, Section 3.1 to 3.12).

UNIT – III

Introduction Chebyshev's function Definition and basic properties of congruences, residue classes and complete residue system, Linear congruences, reduced residue system and the Euler – Fermat theorem. Ploynomial congruences modulo p, Lagrange's theorem, application of Lagrange's theorem (Chap. 4, Sec. 4.1, 4.2 and Chap. 5, Sec. 5.1 to 5.6).

UNIT – IV

Simultaneous linear congruences. The Chinese remainder theorem. Applications of Chinese remainder Theorem. Polynomial congruences with prime power moduli. The principle of cross classification. A decomposition property of reduced residue systems, Quadratic residuces, Legendre's symbol and its properties, Evaluation of (-1/p) and (2/p) Gauss Lemma (Chapter 5, Section 5.7 to 5.11).

UNIT – V

The quadratic reciprocity Law, application of the quadratic reciprocity law, the Jacobi Symbol. Gauss Lemma and the quadratic reciprocity law. The reciprocity law for quadratic Gauss sums.

TEXT BOOK:

1. Introduction to Analytic Number Theory by T.M. Apostol.
2. Introduction to the theory of Numbers by Niven and Zuckerman.

CORE XV

14PMAC43	FUNCTIONAL ANALYSIS	Hours 6 / credits 5

UNIT – I:

Banach spaces – Definition and 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 – Orthogonal sets – The conjugate space H*.

UNIT – IV:

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

UNIT – V:

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

TEXT BOOK:

Introduction to Topology and Modern Analysis by G.F.Simmons

Tata McGraw - Hill Edition 2004

CORE – XVI

14PMAC44	OPERATIONS RESEARCH	Hours 6 / credits 4

UNIT – I

Scope of network applications, network definitions, minimal spanning tree algorithm, shortest route Problem, Maximal flow model, minimum cost capacitated flow problem CPM and PERT (Chapter 6, Section 6.1 to 6.8).

UNIT – II

Why study Queues? Elements of queueing models. Role of exponential distribution, pure birth and death models, relationship between exponential and Poisson distributions, Generalized Poisson queueing model (Chapter 17, Section 17.1 to 17.5).

UNIT – III

Specialized Poisson queues, M/G/1: GD/../… Pollaczek – khintchine (P.K) formula, other queueing models, queueing decision models (Chapter 17, Section 17.6 to 17.10).

UNIT – IV

Introduction, unconstrained Problems, constrained Problems (Chapter 20, Section 20.1 to 20.4).

UNIT – V

Unconstrained non-linear algorithms, constrained algorithms (Chapter 21, Section 21.1 to 21.3).

TEXT BOOK:

Operation Research – An introduction, VI Edition,

By H.A. Taha, prentice – Hall of India Pvt. Ltd., 1997

ELECTIVE IV

14PMAE41	ADVANCED FUNCTIONAL ANALYSIS	Hours 6 / credits 4

UNIT I:

Compact linear maps-Spectrum of a compact operators. (Chapter 5-section 17,18)

UNIT II:

Inner product spaces-Ortho normal sets-Projections and Riesz Representation theorem. (Chapter 6-section 21, 22, 24)

UNIT III:

Bounded operators and adjoints-normal,unitary and self adjoint operators,spectrum and numerical range. (Chapter 7-section 25,26,27)

UNIT IV:

The definitions and some examples of Regular and singular elements-Topological divisors of zero-The spectrum-The formula for the spectral radius. (Chapter 12- Section 65 to 68 From text book 2)

UNIT V:

The Gelfand mapping- Applications of the formula $r(x) = \lim \left\| x^n \right\|^{1/n}$ -Involution in Banach Algebras-The Gelfand Neumark Theorem. (Chapter 13- Section 70 to 73 From text book 2)

TEXT BOOK:

1.Functional Analysis , by B.V.Limaye (Unit I –III)

2.Introduction to Topology and Modern Analysis by G.F.Simmons(unit IV, V)