GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M.SC. MATHEMATICS COURSE STRUCTURE UNDER CBCS SYSTEM

(For the candidates admitted from the year 2015- 2016 onwards)

SEMESTER	COURSE	SUBJECT TITLE	SUBJECT CODE	INSTR. HOURS WEEK	CREDIT	EXAM HOURS	MARKS		TOTAL
							INT	ESE	
I	Core Course – I	Algebra – I	P15MM1C1	6	5	3	**25**	**75**	100
	Core Course – II	Real Analysis	P15MM1C2	6	5	3	**25**	**75**	100
	Core Course – III	Ordinary Differential Equations	P15MM1C3	6	5	3	**25**	**75**	100
	Core Course – IV	Classical Mechanics	P15MM1C4	6	5	3	**25**	**75**	100
	Elective Course - I	Graph Theory	P15MM1E1	6	5	3	**25**	**75**	100
				30	**25**				**500**
II	Core Course – V	Algebra – II	P15MM2C5	6	5	3	**25**	**75**	100
	Core Course – VI	Complex Analysis	P15MM2C6	6	5	3	**25**	**75**	100
	Core Course – VII	Topology	P15MM2C7	6	5	3	**25**	**75**	100
	Core Course - VIII	Partial Differential Equations	P15MM2C8	6	5	3	**25**	**75**	100
	Elective Course-II	Numerical analysis	P15MM2E2	6	5	3	**25**	**75**	100
				30	**25**				**500**
III	Core Course – IX	Functional Analysis	P15MM3C9	6	5	3	**25**	**75**	100
	Core Course – X	Integral Equations, Calculus of Variation and Fourier Transforms	P15MM3C10	6	5	3	**25**	**75**	100
	Core Course – XI	Differential Geometry	P15MM3C11	6	5	3	**25**	**75**	100
	Core Course - XII	Advanced Operations Research	P15MM3C12	6	5	3	**25**	**75**	100
	Elective Course - III	Probability and Stochastic Process	P15MM3E3	6	5	3	**25**	**75**	100
				30	**25**				**500**
IV	Core Course – XIII	Theory of Numbers	P15MM4C13	6	5	3	**25**	**75**	100
	Elective Course - IV	Measure Theory and integration	P15MM4E4	6	5	3	**25**	**75**	100
	Project Work	Project	P15MM4PW	18	5	3	**	**	100
				30	**15**				**300**
TOTAL				**120**	**90**				**1800**

** Dissertation – 80 Marks and Viva Voce Examinations – 20 Marks

CHAIRMAN
BOARD OF STUDIES IN MATHEMATICS

CONTROLLER OF EXAMINATIONS

Sl. No.: | | **Subject Code:** | P15MMICI |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS – I SEMESTER – CORE COURSE - I

(For the candidates admitted from the year 2015 -16 onwards)

ALGEBRA - I

UNIT 1: A counting principle – Normal subgroups and quotient rings – Homomorphism - Another counting principle – Sylow's theorem. (Ch. 2: § 2.5-2.7, 2.11, 2.12)

UNIT 2: Ring Theory – Homomorphism – Ideals and Quotient Ring – More about ideals and Quotient Rings – Euclidean Rings. (Ch. 3: § 3.1-3.7)

UNIT 3: Dual space – Inner product space – Module – Structure theorem for finitely generated modules over Euclidean Rings. (Ch. 4: § 4.3-4.5)

UNIT 4: Field Theory – Extension field – Transcendence of e – Roots of polynomial. (Ch. 5: § 5.1-5.3)

UNIT 5: More about roots – Elements of Galois theory – Solvability of radicals. (Ch. 5: § 5.5-5.7)

TEXT BOOK:

1. I. N. Herstein, **"Topics in Algebra"**, 2nd Edition. John Wiley & Sons, 2010.

REFERENCE BOOKS:

1. John B. Fraley, **"Abstract Algebra"**, Pearson Education, 7th Edition, 2007.
2. P. B. Bhattacharyya, **"Abstract Algebra"**, Cambridge University Press, 2nd Edition, 2006.
3. Thomas Hungerford, **"Algebra"**.

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | **P15MMIC2** |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS – I SEMESTER – CORE COURSE - II

(For the candidates admitted from the year 2015 -16 onwards)

REAL ANALYSIS

UNIT-I **Basic topology:** Finite, countable and uncountable sets –Metric Spaces – Compact sets-Perfect sets-Connected sets. (Ch 2: pg no 24-46)
Continuity: Limits and continuous functions- continuity and compactness - continuity and connectedness - Discontinuity, Monotonic functions Infinity Limits and Limits at Infinity
. (Ch 4: pg no 93-102)

UNIT-II **Differentiation:** Derivative of Real Function- Mean value Theorems - The continuity of Derivatives – L' Hopital's Rule - Taylor's Theorem - Differentiation of Vector valued functions.
(Ch 5: pg no 103-119)

UNIT-III **The Riemann Steltjes Integral:** Definition and Existence of Integral Properties of Integral – Integration and Differentiation – Rectifiable Curves. (Ch 6: pg no 120-142)

UNIT-IV **Sequence and series of functions:** Sequence of functions – Discussion of main problem – Uniform Convergence and Continuity – Uniform convergence and Integration – Uniform Convergence and Differentiation – Equicontinuous families of functions - The Stone-Weierstrass theorem.
(Ch 7: pg no 143-171)

UNIT-V **Function of several variables:** Linear Transformations – Differentiation, The contraction Principle – The inverse function theorem – The Implicit function theorem. (Ch 9: pg no 204-228)

TEXT BOOK:

1. Walter Rudin, **"Principles of mathematical Analysis"**, (3rd Edn), Tata Graw-Hill

REFERENCE BOOKS:

1. Tom. M. Apostol, **"Mathematical Analysis"**, Narosa Publishing House, New Delhi-1997.
2. R. G. Bartle, D. R. Sherbert, **"Introduction to Real Analysis"**, John Wiley and sons, New York-1982.
3. Kenneth A. Ross, **"Elementary Analysis: The theory of calculus"**, Springer New York-2004.
4. N. L. Carothers, **"Real Analysis"**, Cambridge university press, UK, 2000.
5. S. C. Malik, **"Mathematical Analysis"**, Willey Eastern Ltd, New Delhi-1985.
6. K. R. Stromberg, Wadsworth, **"An Introduction to classical Real Analysis",** 1981.

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | P15MMIC3 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS - I SEMESTER – CORE COURSE - III

(For the candidates admitted from the year 2015 -16 onwards)

ORDINARY DIFFERENTIAL EQUATION

UNIT 1: The general solution of the homogeneous equation – The use of one known solution to find another – The method of variation of parameters – Power series solutions – A review of power series – Series solution of a first order equations – Second order linear equations: Ordinary points. (Ch. 3: § 15, 16, 19 and Ch 5: § 26 -28)

UNIT 2: Regular singular points – Gauss's hyper geometric equation – The point at infinity – Legendre polynomials– Properties of Legendre polynomials – Bessel functions – Properties of Bessel functions . (Ch. 5: § 29 - 32 and Ch 8: § 44 - 47)

UNIT 3: Linear systems of First order equations – Homogeneous equations with constant coefficients –The method of solutions of successive approximations and Picard's theorem. (Ch.10: § 55, 56 & Ch 13: § 68, 69)

UNIT 4: Qualitative properties of solutions – Oscillation theory and Sturm separation theorem- Sturm comparison theorem – Eigen values, Eigen functions and the Vibrating string. (Ch. 4: § 24, 25 and Ch 7: § 40)

UNIT 5: Nonlinear equations: Autonomous Systems: the phase plane and its phenomena– Types of critical points: Stability – Critical points and stability for linear systems – Stability by Liapunov's direct method – Simple critical points of nonlinear systems. (Ch. 11: § 58-62)

TEXT BOOK:

G.F. Simmons, **"Differential Equations with Applications and Historical notes"**, T.M.H., New Delhi, 2003

REFERENCE BOOKS:

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

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | P15MM1C4 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS - I SEMESTER – CORE COURSE - IV

(For the candidates admitted from the year 2015 -16 onwards)

CLASSICAL MECHANICS

UNIT 1: Mechanics of a particle, Mechanics of a system of particles, Constraints. (Ch. 1: § 1.1-1.3)

UNIT 2: 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 – Simple applications of Lagrangian formulation. (Ch. 1: § 1.4-1.6 & Ch 2: § 2.1-2.2)

UNIT 3: Derivation of Lagrange's equations from Hamilton's principle, Extension of Hamilton's principle to non holonomic systems, Advantage of a variational principle formulation, conservation theorems and symmetry properties. (Ch. 2: § 2.3-2.6)

UNIT 4: 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. (Ch. 3: § 3.1-3.4)

UNIT 5: The differential equation for the orbit and integrable 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-Runge-Lenz vector. (Ch. 3: § 3.5-3.9)

TEXT BOOK:

H. Goldstein, **"Classical Mechanics"**, Second edition, Addison Wesley, New York, 1980

REFERENCE BOOKS:

Donald T. Greenwood ,**"Classical Dynamics"**, PHI Pvt. Ltd., New Delhi 1985.

CHAIRMAN – BOS **COE**

Sl. No.: | Subject Code: P15MMIE1

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS – I SEMESTER – ELECTIVE COURSE – I

(For the candidates admitted from the year 2015-16 onwards)

GRAPH THEORY

UNIT- I **Graphs, subgraphs and Trees:** Graphs and Simple graphs – Graph Isomorphism – The Incidence and Adjacency matrices – Subgraphs – Vertex degrees – Paths and Connection – Cycles – Trees – Cut Edges and Bonds – Cut Vertices. (Ch. 1: § 1.1-1.7, and Ch. 2: § 2.1-2.3)

UNIT 2: **Connectivity, Euler tours and Hamilton cycles:** Connectivity – Block – Euler tours – Hamilton cycles. (Ch. 3: § 3.1 and Ch. 4: § 4.1-4.2)

UNIT 3: **Matching, Edge colouring:** Matching – Matching and coverings in Bipartite graphs – Edge Chromatic number – Vizing's theorem. (Ch. 5: § 5.1-5.2, and Ch. 6: § 6.1-6.2)

UNIT 4: **Independent sets and cliques, vertex colouring:** Independent sets – Ramsey's theorem – Chromatic number – Brook's theorem. (Ch. 7: § 7.1-7.2 and Ch. 8: § 8.1-8.2, 8.4)

UNIT 5: **Planer Graphs:** Plane and planar graphs – Dual graphs – Euler's formula – Five colour theorem and the four colour conjecture. (Ch. 9: § 9.1-9.3, 9.6)

TEXT BOOK:

J.A. Bondy and U.S.A. Murthy, **"Graph Theory and Applications"**, Macmillan, London 1976.

CHAIRMAN – BOS **COE**

Sl. No.: | **Subject Code:** P15MM2C5

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS - II SEMESTER – CORE COURSE -V

(For the candidates admitted from the year 2015-16 onwards)

ALGEBRA - II

UNIT 1: Linear transformation – Characteristic roots – Matrices.
(Ch. 6: § 6.1-6.3)

UNIT 2: Canonical form – Triangular form – Nilpotent linear transformation – Decomposition of V – Jordan form.
(Ch. 6: § 6.4-6.6)

UNIT 3: Rational canonical form – Trace and Transpose – Determinants.
(Ch. 6: 6.7-6.9)

UNIT 4: Hermitian, Unitary and Normal Transformation – Real Quadratic forms.
(Ch. 6: § 6.10-6.11)

UNIT 5: Finite field – Wedderburn theorem on finite division ring.
(Ch. 6 § 7.1-7.2)

TEXT BOOK:

I.N.Herstein, **"Topics in Algebra"**, 2nd Edition. John Wiley & Sons, 2010

REFERENCE BOOKS:

1. John B. Fraley, **"Abstract Algebra"**, Pearson Education, 7th Edition 2007.
2. P. B . Bhattacharyya, **"Abstract Algebra"**, Cambridge University Press, 2nd Edition 2006.
3. Thomas Hungerford, **"Algebra"**.

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | P15MM2C6 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS - II SEMESTER – CORE COURSE - VI

(For the candidates admitted from the year 2015-16 onwards)

COMPLEX ANALYSIS

UNIT 1: **Analytical Functions**: Cauchy-Riemann Equation, Analyticity, Harmonic functions, Bilinear transformations and Mappings: Basic Mappings, Linear Fractional transformations. (Ch. 5:§5.1-5.3, Ch. 3: §3.1,3.2)

UNIT 2: **Power Series**: Sequences revisited, Uniform Convergence, Maclaurin and Taylor Series, Operations on Power Series, Conformal Mappings. (Ch. 6: §6.1-6.4, Ch. 11: §11.1)

UNIT 3: **Complex Integration and Cauchy's Theorem**: Curves, Parameterizations, Line Integrals, Cauchy's Theorem. (Ch. 7: §7.1-7.4)

UNIT 4: **Applications of Cauchy's Theorem**: Cauchy's Integral Formula, Cauchy's Inequality and Applications, Maximum Modules Theorem. (Ch. 8: §8.1-8.3)

UNIT 5: **Laurent's Series and The Residue Theorem**: Laurent's Series, Classification of Singularities, Evaluation of Real Integrals, Argument Principle. (Ch. 9: §9.1-9.4)

TEXT BOOK:

S.Ponnusamy and Herb Silverman, **"Complex Variables with Applications"**, Birkhauser, Boston, 2006

REFERENCE BOOKS:

1. S. Ponnusamy, **"Foundations of complex analysis"**, 2nd edition, Narosa Publishing House, 2005.
2. H. A. Priestley, **"Introduction to Complex Analysis**, 2nd edition, Oxford University Press. 2006.
3. Serge Lang, **Complex Analysis**, Addison Wesley, 1977.
4. V.arunakaran, "**Complex Analysis**", Narosa Publishing House, New Delhi, 2002.
5. R. V. Churchill, J. W. Brown, "**Complex Variables & Applications"**, McGraw Hill, 1990.
6. JohnB.Conway, "**Functions of One Complex Variable"**, Narosa Publishing House, 2005.
7. TristanNeedham, **Visual Complex Analysis**, Oxford University Press. 1997.
8. Lars. V. Ahlfors, **Complex Analysis**, 3rd Edition, McGraw-Hill Book Company, Tokya, 1979.

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | P15MM2C7 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS - II SEMESTER – CORE COURSE - VII

(For the candidates admitted from the year 2015 -16 onwards)

TOPOLOGY

UNIT 1: Topological spaces: Topological spaces - Basis for a topology - The order Topology - The Product Topology and X×Y – The subspace Topology – Closed set and limit Points continuous functions - The Product Topology. (Ch. 2: § 12-19)

UNIT 2: The metric topology – Connected spaces – Connected subspaces of the real line – Components and Local connectedness. (Ch. 2: § 20, 21 and Ch. 3: § 23-25)

UNIT 3: Compact spaces – Compact subspaces of the real line – Limit point compactness – Local compactness. (Ch. 3: § 26-29)

UNIT 4: Countability axioms – The separation axioms – Normal spaces – The Urysohn lemma - The Urysohn Metrization theorem – Tietze Extension Theorem. (Ch. 4: § 30-34)

UNIT 5: The Tychonoff theorem – Complete metric spaces – Compactness in metric spaces – Pointwise and Compact convergence. (Ch. 5: § 37 and Ch. 7: § 43, 45-46)

TEXT BOOK:

1. James. R. Munkres, **"Topology"**, second Edition, Prentice Hall of India Pvt., Ltd., New Delhi 2005.

REFERENCE BOOKS:

1. George F.Simmons, **"Introduction to topology and modern analysis"**, McGraw Hill Book Co., 1963.
2. J.Dugundji, **"Topology"**, Prentice hall of India, New Delhi 1975.
3. J.L. Kelly, **"General topology"**, Van Nostrand Reinhold Co., New York.

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | P15MM2C8 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS - II SEMESTER – CORE COURSE - VIII

(For the candidates admitted from the year 2015-16 onwards)

PARTIAL DIFFERENTIAL EQUATIONS

UNIT 1: First order PDE – Curves and Surfaces – Genesis of First order PDE – Classification of Integrals - Linear Equations of the First order – Pfaffian Differential Equations – Compatible Systems – Charpit's Method – Jacobi's Method. (Ch. 1: § 1.1-1.8)

UNIT 2: Integral Surfaces through a given Curve – Quasi-linear equations – Non-linear first order P.D.E. (Ch. 1: § 1.9-1.11)

UNIT 3: Second order PDE: Genesis of second order PDE – Classification of second order PDE: One-dimensional Wave equation – Vibrations of an Infinite string – Vibrations of a semi-Infinite string – Vibrations of a string of finite Length (Method of separation of variables).
(Ch. 2: § 2.1-2.3.5 except 2.3.4)

UNIT 4: Laplace's Equation: Boundary Value Problems – Maximum and Minimum principles – The Cauchy Problem – The Dirichlet Problem for the Upper Half Plane – The Neumann Problem for the Upper Half Plane – The Dirichlet Problem for a Circle – The Dirichlet Exterior Problem for a Circle – The Neumann Problem for a Circle – The Dirichlet Problem for a Rectangle – Harnack's Theorem –Laplace's Equation – Green's Function.
(Ch. 2: § 2.4-2.4.11)

UNIT 5: Heat Conduction Problem – Heat Conduction – Infinite Rod Case – Heat Conduction Finite Rod Case – Duhamel's Principle –Wave Equation – Heat Conduction Equation. (Ch. 2: § 2.5-2.6.2)

TEXT BOOK:

T. Amarnath, **"An Elementary Course in Partial Differential Equations"**,] Narosa Publishing House, 2003.

REFERENCE BOOKS:

1. I.C. Evans, **"Partial Differential Equations"**, Graduate Studies in Mathematics Vol. 19 AMS, 1998.
2. Ian. Snedden, **"Elements of Partial Differential Equations"**, McGraw-Hill Book Company, 1985.
3. F. John, P. Prasad, **"Partial Differential Equations"**.

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | P15MM2E2 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS - II SEMESTER – ELECTIVE COURSE- II

(For the candidates admitted from the year 2015-16 onwards)

NUMERICAL METHODS

UNIT 1: Introduction, Bisection method, iteration methods based on first degree equation, Iteration methods based on second degree equation, Rate of convergence, General iteration methods, Method for complex Roots, Polynomial equations. (Ch. 2: § 2.1 to 2.9 - Exclude 2.7)

UNIT 2: Introduction, Direct methods, Error analysis for direct methods, Iteration methods, Eigen values and Eigen vectors, Power method. (Ch. 3: §3.1 to 3.6)

UNIT 3: Introduction Lagrange and Newton interpolations, Finite difference Operators, Interpolating polynomials using finite differences, Hermite interpolation, Piecewise and spline interpolation. (Ch.4: § 4.1 to 4.6)

UNIT 4: Introduction, Numerical Differentiation, Extrapolation methods, Partial Differentiation, Numerical integration, Methods based on interpolation, Composite integration methods, Romberg method. (Ch.5: § 5.1, 5.2, 5.4 to 5.9, 5.10)

UNIT 5: Introduction, Difference equation, Numerical methods, Single step methods. (Ch.6: § 6.1 to 6.4)

TEXT BOOK:

1. M. K. Jain, S. R. K. Iyengar, and R. K. Jain, **"Numerical Methods for Scientific and Engineering Computation"**, Fourth Edition, New Age International Publishers, 2003.

REFERENCE BOOKS:

1. R. L. Burden, J. Douglas Faires, **"Numerical Analysis"**, Thompson Books, USA, 2005.
2. S. S. Sastry, **"Introductory Methods of Numerical Analysis"**, Prentice Hall of India Private limited, New Delhi-2001.
3. Curtis. F. Gerald, Patrick O. Wheatley **"Applied Numerical Analysis"**, 5th Edition, Pearson Education, New Delhi, 2005.

(**Note**: Scientific calculator is allowed)

CHAIRMAN – BOS **COE**

Sl. No. | **Subject Code:** P15MM3C9

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS - III SEMESTER – CORE COURSE - IX

(For the candidates admitted from the year 2015-16 onwards)

FUNCTIONAL ANALYSIS

UNIT 1: **Banach Space:** Definition and some Examples – continuous linear transformations – The Hahn Banach theorem – The natural imbedding of N in N* - The open mapping theorem – The conjugate of an operator. (Ch. 9: § 46-51)

UNIT 2: **Hilbert Space:** Definition and some properties – Orthogonal complements – orthonormal sets – the conjugate space H* - the adjoint of an operator – self adjoint operators – normal and unitary operators (Ch. 10: § 52-59)

UNIT 3: **Fnite Dimensional Spectral Theory:** Matrices – Determinants and the spectrum of an operator – the spectral theorem – A survey of the situation. (Ch. 11: § 60-63)

UNIT 4: **General Preliminaries of Banach Algebras:** Definition and some Examples – Regular and singular elements – Topological divisors of zero – the spectrum – the formula for spectral radius – the radical and semi-simplicity. (Ch. 12: § 64-69)

UNIT 5: **The structure of Commutative Banach Algebra:** The Gel'fand mapping – the application of the formula $r(x) = \lim \|x^n\|^{1/n}$ – involution in Banach algebras – The Gel'fand Neumark theorem. (Ch. 13: § 70-73)

TEXT BOOK:

1. G. F. Simmons, **"An introduction to Topology and Modern Analysis"**, McGraw Hill Company, 1968.

REFERENCE BOOKS:

1. W. Rudin, **"Functional Analysis"**, Tata McGraw Hill 1974.
2. Erwin Kreyszig, John Wiley & Sons **"Introductory Functional Analysis with Applications"**, (ASIA) Pvt. Ltd, Singapore, 2001.
3. K. Yasodha, Springer Verlag, **"Functional Analysis"**, 1974.

CHAIRMAN – BOS **COE**

Sl. No. | **Subject Code:** P15MM3C10

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS – III SEMESTER – CORE COURSE - X

(For the candidates admitted from the year 2015-16 onwards)

INTEGRAL EQUATIONS, CALCULUS OF VARIATION AND FOURIER TRANSFORMS

UNIT 1: Calculus of variation –maxima and minima-The simplest case - Natural boundary and Transition condition – Variational notation – More general case – Constraints and Lagrange's multiples – Variable end points – Strum – Liouville problems. (Ch. 2: § 2.1-2.9[2])

UNIT 2: Fourier Transform – Fourier Sine and Cosine Transforms – Properties of Convolution – Solving integral equations – Finite Fourier Transforms - Finite Fourier Sine and Cosine Transforms – Fourier integral theorem – Parseval's Identity. (Ch. 7[3])

UNIT 3: Hankel Transforms(finite case only) – Definition – Inverse formula – Some important results for Bessel functions - Linearity Property – Hankel transform of differential operators – Parseval's Theorem (Ch. 9[3])

UNIT 4: Linear Integral equations – Definition - Regularity conditions – Special kind of Kernals – Eigen values and Eigen functions – Convolution Integral – The inner (or) Scalar product of two functions – Reduction to a Algebraic Equations – Examples – Fedholm alternative – Examples – An Approximate method. (Ch. 1 & 2[1])

UNIT 5: Method of Successive approximations – Iterative Scheme – Examples – Voltra Integral Equations – Examples – Some Results about Resolvant Kernal – Classical Fredholm theory – The Method of solution of Fredholm – Fredholm's First; Second and Third Theorems and simple problems. (Ch. 3 & 4[1])

TEXT BOOK:

1. Ram P. Kanwal, **"Linear Integral Equations"**, Theory and Practice, Academic Press 1971.
2. F. B. Hildebrand, **"Methods of Applied Mathematics"**, second Edition PHI, New Delhi 1972.
3. A. R. Vasistha, R. K. Gupta, **"Integral transforms"**, Krishna Prakasan Mandir Pvt. Ltd.

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | **P15MM3C11** |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS – III SEMESTER – CORE COURSE - XI

(For the candidates admitted from the year 2015-16 onwards)

DIFFERENTIAL GEOMETRY

UNIT 1: **Space Curves:** Definition of a space curve – Arc length – Tangent – Normal and Binormal – Curvature and Torsion – Contact between curves and surfaces – Tangent surface – Involutes and Evolutes - Intrinsic equations – Fundamental Existence theorem for space curves - Helics. (Ch. 1: § 1-9)

UNIT 2: **Intrinsic properties of a surface:** Definition of a surface- curves of surfaces- surface of revolution – Helicoids – Metric- Direction coefficients – Families of curves – Isometric correspondence - Intrinsic properties. (Ch. 2: § 1-9)

UNIT 3: **Geodesics:** Geodesics – Canonical Geodesics equations – Normal property of Geodesics – Existence theorem – Geodesics Parallels – Geodesics curvature – Gauss-Bonnet theorem – Gaussian curvature - surface of constant curvature. (Ch. 2: §10-18)

UNIT 4: **Local non - Intrinsic properties of a surface:** The second fundamental form – Principle curvatures – Lines of curvature – Developables – Developables associated with space curves – Developables associated with curves on surface – Minimal surfaces – Ruled surfaces. (Ch. 3: § 1-8)

UNIT 5: **Differential Geometry of surfaces:** Introduction- Compact surfaces whose points are umblics – Hilbert's lemma – Compact surface of constant Gaussian or Mean curvature – Complete surface – Characterization of Complete Surfaces – Hilbert's theorem – Conjugate points on geodesics. (Ch. 4: § 1-8)

TEXT BOOK:

T. J. Wilmore, **"An Introduction to Differential Geometry"**, Oxford University Press, (17th impression) New Delhi – 2002 (Indian print)

REFERENCE BOOKS:

1. Struik. D. T, **"Lectures on Classical Differential Geometry"**, Addison - Welsley Mass –1950
2. Kobayashi S. And Nomizu. K.**"Foundations of Differential Geometry"**, Interscience Publishers – 1963.
3. Wilhelm Klingenberg: **"A Course in Differential Geometry"**, Graduate Textsin.
4. J. A. Thorpe. **"Elementary topics in Differential Geometry"**, Under – Graduate Texts in Mathematics, Springer Verlag 1979.
5. D. Somasundaram, **"Differential Geometry"**, Narosa Publishing House, 2014.

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | P15MM3C12 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS - III SEMESTER – CORE COURSE - XII

(For the candidates admitted from the year 2015-16 onwards)

ADVANCED OPERATIONS RESEARCH

UNIT 1: Integer Programming Problems Pure and Mixed I.P.P – Construction of Gemory's constraints, Fractional cut method – All I.P.P – Fractional cut method – Mixed L.P.P Branch and bound method, Application of integer programming (Ch.9: § 9.1,9.2,9.2.1,9.2.2)

UNIT 2: Dynamic programming – Bellman's Principle of Optimality – The recursive equation approach – Characteristics of a dynamic programming – Dynamic programming algorithm – Solutions of discrete D.P.P– Solution of L.P.P using Dynamic Programming approach. (Ch.12: § 12.112.2,12.3,12.4)

UNIT 3: Queuing system – Elements and Characteristic of queuing system – Pure birth process and pure death process – Classification of queuing models – Single server models (M/M/1: ∞ - FIFO), (M/M/1: N/EIEO) birth and death process – Multi server models (a/M/c: ∞ /FIFO), (M/M/1: N/EIEO) and characteristics of models.
(Ch.18:§18.1,18.2,18.3,18.4,18.4.1,18.4.2,18.6,18.6.1,18.6.2,18.6.3,18.6.4)

UNIT 4: Inventory control – Types of Inventories – Objectives of Inventory control – Costs associated with inventories – Factors affecting inventory control – Concept of EOQ – Deterministic models with no shortage – Deterministic models with shortage – Problems of EOQ with price break – Multi item deterministic model – ABC Analysis.
(Ch.13: § 13.1,13.2,13.3,13.3.1,13.3.2,13.3.3)

UNIT 5: Network Scheduling by CPM/PERT – Network basic components – Rules of Network construction – CPM – Types of Floats – Critical path – Cost slop – Crashing the network – Probability consideration in PERT – Distinction between PERT and CPM.
(Ch. 6: § 6.1,6.2,6.3,6.5,6.5.1,6.5.2,6.5.3,6.5.4,6.5.5)

TEXT BOOK:

H.A. Taha – **"Operations Research: An Introduction"**, 9th Edition, Macmillan, 2013.

REFERENCE BOOKS:

1. Kanti Swarup, P. K. Gupta & Man Mohan – **"Operations Research"**, Sultan Chand & sons, 13th Edition.
2. F. S. Hiller & G.J. Lieberman, **"Introduction to Mathematical Programming"**, McGraw – Hill International Edition.

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | P15MM3E3 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS - III SEMESTER – ELECTIVE COURSE - III

(For the candidates admitted from the year 2015-16 onwards)

PROBABILITY AND STOCHASTIC PROCESSES

UNIT 1: The probability set function – Conditional probability and Independence – Random variable of discrete type and continuous type – Transformations – Expectation of random variable – Some special expectations – Important inequalities. (Ch. 1: §1.3 to 1.10[1])

UNIT 2: Distribution of two random variables – Transformations: Bivariate Random variables - Conditional distribution and expectation – Correlation coefficient – Independent random variables - Expectation of functions – Convergence in probability – Convergence in Distribution – Central Limit Theorem. (Ch. 2: § 2.1 to 2.5, Ch. 4: § 4.1 to 4.4[1])

UNIT 3: Stochastic processes – An Introduction – Specification of Stochastic processes – Markov Chains: Definitions and Examples – Higher Transition probabilities – Generalization of Independent Bernoulli Trails: Sequence of Chain – Dependent Trails. (Ch. 1: § 1.5, Ch. 2: § 2.1 to 2.3[2])

UNIT 4: Markov Chains: Classification of States and Chains – Determination of Higher Transition probabilities – Stability of a Markov Chains - Markov Chain with Denumerable number of states - Reducible Chains - Markov Chain with Continuous state space.
(Ch. 2: § 2.4 to 2.6, § 2.8, 2.9, 2.11[2])

UNIT 5: Markov processes with Discrete state space : Poisson process – Poisson process and related distributions – Generalization of Poisson process – Birth and Death process - Markov processes with Discrete state space (Continuous time Markov Chains). (Ch. 3: §3.1 to 3.5[2])

TEXT BOOKS:

1. Robert V. Hogg, Allen Craig and Joseph W. Mckean., **"Introduction to Mathematical Statistics"**, 6th edition, Peearson Prentice Hall Publications.
2. J. Medhi **"Stochastic Processes"**, 3rd edition, New Age International Publishers

REFERENCE BOOKS:

Paul G. Hoel, **"Introduction to mathematical statistics"**, John Wiley and sons Inc.

1. S.C Gupta and V.K. Kapoor., **"Fundamentals of Mathematical statistics"**, S. Chand Company, 2008.
2. Samuel Karlin, Howard M. Taylor, **"A first course in Stochastic processes"**, 2nd Edition, Academic Press, 1975.
3. Narayan Bhat, **"Elements of Applied Stochastic Process"**, 2nd edition, John Wiley, 1984.
4. S. K. Srinivasan and K. Mehata, **"Stochastic Processes"**, Tata McGraw Hill, 1976.
5. N. U. Prabhu, **"Stochastic Processes"**, Macmillan, 1965.

CHAIRMAN – BOS **COE**

Sl. No. | | **Subject Code:** | P15MM4C13 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS – IV SEMESTER – CORE COURSE - XIII

(For the candidates admitted from the year 2015-16 onwards)

THEORY OF NUMBERS

UNIT 1: Introduction – Divisibility – Primes–The Binomial theorem – Congruences- Euler's totient – Fermat's, Euler's and Wilson's theorems – Solution of Congruences – The Chinese Remainder theorem. (Ch.1& Ch.2: § 2.1-2.3)

UNIT 2: Techniques of Numerical calculations- Public key cryptography– Prime power moduli- primitive roots and power residues- Congruences of degree two. (Ch.2: § 2.4-2.6, 2.8-2.9)

UNIT 3: Number theory from an algebraic viewpoint- Groups, Rings and Fields- Quadratic Residues- The Legendre symbol (a/r) where r is an odd prime- Quadratic reciprocity- The Jacobi symbol (p/q) where q is an odd positive integer. (Ch.2: § 2.10,2.11& Ch.3: §3.1-3.3)

UNIT 4: Binary Quadratic forms- Equivalence and reduction of Binary Quadratic forms- Sums of two squares – Positive definite binary quadratic forms- Greatest integer function- Arithmetic functions- The Mobius inversion formula- Recurrence functions- Combinatorial number theory. (Ch.3: § 3.4-3.7& Ch.4)

UNIT 5: Diophantine Equations – The equation ax+by = c – Simultaneous linear Equations- Pythagorean triangles- Assorted Examples. (Ch.5: § 5.1-5.4)

TEXT BOOK:

1. Ivan Niven, Herbert S. Zukerman and Hugh L. Montgomery, **"An Introduction to the Theory of Numbers"**, Fifth Edition John Wiley and Sons, Inc, 2010.

REFERENCE BOOKS:

1. David M. Burton, **"Elementary number theory"**, W. M. C. Brown publishers, Dubuque, Lawa, 1989.
2. William J. Leveque, **"Fundamentals of Number Theory"**, Addition-Wesley Publishing Company, Phillipines, 1977.

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | **P15MM4E4** |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M. Sc., MATHEMATICS – IV- SEMESTER – ELECTIVE COURSE - IV

(For the candidates admitted from 2015-16 onwards)

MEASURE THEORY AND INTEGRATION

UNIT 1: **Measure on Real line:** Lebesgue outer measure – Measurable sets – Regularity – Measurable function – Borel and Lebesgue measurability. (Ch. 2: § 2.1-2.5)

UNIT 2: **Integration of Functions of a Real Variable:** Integration of Non-negative functions – The general integral –Riemann and Lebesgue integrals. (Ch. 3: § 3.1,3.2 & 3.4)

UNIT 3: **Differentiation:** The Four derivatives – Continuous Non-differentiable functions – Functions of Bounded Variation. (Ch. 4: § 4.1-4.3)

UNIT 4: **Abstract measure spaces:** Measures and outer measures – Completion of Measures – Measure spaces – Integration with respect to measure. (Ch. 5: § 5.1-5.6)

UNIT 5: **Convergence in measure:** Almost uniform convergence – Signed measure and the Hahn decomposition – The Jordan decomposition. (Ch. 7: § 7.1 – 7.2 & Ch. 8: § 8.1 – 8.2)

TEXT BOOK:

1. G. de. Barra. **"Measure theory and integration"**, 3rd New Age International Reprint 1996.

REFERENCE BOOKS:

1. M. E. Munroe, **"Measure and Integration"**, 2nd Edition Addison – Wesley Publishing Company – 1971
2. P. K . Jain, V. P. Gupta, **"Lebesgue Measure and Integration"**, New Age International(P) Ltd, New Delhi - 1986 (Reprint - 2000)
3. Richard L. Wheeden and Antoni Zygmund, **"An Introduction to Real Analysis"**, Marcel Dekker Inc. 1977.
4. Inder K. Rana, **"An Introduction to Measure and Integration"**, Narosa Publishing House, New Delhi – 1997.
5. H. L. Royden, **"Real Analysis"**, 4th Edition, PHI Ltd.

CHAIRMAN – BOS **COE**

Sl. No.: | | **Subject Code:** | P15MM4PW |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., MATHEMATICS – IV SEMESTER – PROJECT WORK

(For the candidates admitted from the year 2015-16 onwards)

PROJECT WORK

SL.	Area of Work	Maximum Marks
1.	**PROJECT WORK:** **(i) Plan of the Project** **(ii) Execution of the plan / Collection of data / Organization of materials/ Fabrication Experimental study / Hypothesis, Testing etc., and Presentation of the report.** **(iii) Individual Initiative**	 **20** **45** **15**
2.	**VIVA VOCE EXAMINATION**	**20**
	TOTAL	**100**

PASSING MINIMUM – 50 MARKS

CHAIRMAN – BOS **COE**