GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M.SC. MATHEMATICS COURSE STRUCTURE UNDER CBCS SYSTEM

(For the candidates admitted from the year 2016- 2017 onwards)

SEMESTER	COURSE	SUBJECT TITLE	SUBJECT CODE	INSTR. HOURS WEEK	CREDIT	EXAM HOURS	MARKS		TOTAL
							INT	ESE	
I	Core Course – I	Algebra – I	P16MM1C1	6	5	3	**25**	**75**	100
	Core Course – II	Real Analysis-I	P16MM1C2	6	5	3	**25**	**75**	100
	Core Course – III	Ordinary Differential Equations	P16MM1C3	6	5	3	**25**	**75**	100
	Core Course – IV	Classical Mechanics	P16MM1C4	6	5	3	**25**	**75**	100
	Elective Course - I	Graph Theory	P16MM1E1	6	3	3	**25**	**75**	100
				30	**23**				**500**
II	Core Course – V	Algebra – II	P16MM2C5	6	5	3	**25**	**75**	100
	Core Course – VI	Real Analysis-II	P16MM2C6	6	5	3	**25**	**75**	100
	Core Course – VII	Complex analysis	P16MM2C7	6	5	3	**25**	**75**	100
	Core Course - VIII	Partial Differential Equations	P16MM2C8	6	5	3	**25**	**75**	100
	Elective Course-II	Numerical Methods	P16MM2E2	6	3	3	**25**	**75**	100
				30	**23**				**500**
III	Core Course – IX	Functional Analysis	P16MM3C9	6	5	3	**25**	**75**	100
	Core Course – X	Integral Equations, Calculus of Variation and Fourier Transforms	P16MM3C10	6	5	3	**25**	**75**	100
	Core Course – XI	Topology	P16MM3C11	6	5	3	**25**	**75**	100
	Elective Course - III	Advanced Operations Research	P16MM3E3	6	3	3	**25**	**75**	100
	Elective Course - IV	Probability and Stochastic Process	P16MM3E4	6	3	3	**25**	**75**	100
				30	**21**				**500**
IV	Core Course – XII	Theory of Numbers	P16MM4C12	6	5	3	**25**	**75**	100
	Core Course – XIII	Differential Geometry	P16MM4C13	6	5	3	**25**	**75**	100
	Core Course – XIV	Measure Theory and integration	P16MM4C14	6	5	3	**25**	**75**	100
	Elective Course -V	Fluid Dynamics	P16MM4E5	6	3	3	**25**	**75**	100
	Project Work	Project	P16MM4PW	6	5	3	**	**	100
				30	**23**				**500**
TOTAL				**120**	**90**				**2000**

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

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BOARD OF STUDIES IN MATHEMATICS

CONTROLLER OF EXAMINATIONS

Sl. No.: | | **Subject Code:** | **P16MM1C1** |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016 -17 onwards)

ALGEBRA-I

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

UNIT – III Field Theory – Extension field – Transcendence of *e.* (Ch. 5: § 5.1, 5.2)

UNIT – IV Roots of polynomial-More about roots (Ch. 5: § 5.3&5.5)

UNIT – V Elements of Galois theory – Solvability of radicals. (Ch. 5: § 5.6,5.7)

TEXT BOOK:

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

REFERENCES:

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

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Sl. No.: | | **Subject Code:** | **P16MM1C2** |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016 -17 onwards)

REAL ANALYSIS - I

UNIT-I **The Real and Complex Number Systems :** Introduction – Ordered sets – Fields – The Real Field – Extended Real Number system – The Complex Field – Euclidean Spaces . (Ch. 1: pg no 01-17)

UNIT-II **Basic topology:** Finite, countable and uncountable sets – Metric Spaces – Compact sets-Perfect sets-Connected sets. (Ch. 2: pg no 24-46)

UNIT III **Numerical Sequences and series:** Convergent Sequences – Sub sequences – Cauchy Sequences – Upper and lower limits – Some special Sequences – Series – Series of Non negative terms. (Ch. 3: pg no 47-62)

UNIT IV **Series:** The Number e – The root and ratio test – Power series – Summation by parts – Absolute Convergence- Addition and Multiplication of series - Rearrangements. (Ch. 3: pg no 63 - 82)

UNIT V **Continuity:** Limits and continuous functions- continuity and compactness - continuity and connectedness - Discontinuity, Monotonic functions- Infinite Limits and Limits at Infinity. (Ch. 4: pg no 89-102)

TEXT BOOK:

"Principles of mathematical Analysis" by Walter Rudin (3rd Edn), Tata McGraw-Hill

REFERENCES:

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 , **"An Introduction to classical Real Analysis"** Wadsworth, 1981

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Sl. No.: | | **Subject Code:** | P16MM1C3 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016 -17 onwards)

ORDINARY DIFFERENTIAL EQUATION

UNIT - I 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 - II Regular singular points – Legendre polynomials– Properties of Legendre polynomials – Bessel functions – Properties of Bessel functions.
(Ch. 5: § 29 and Ch 8: § 44 - 47)

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

UNIT -V Types of critical points: Stability – Critical points and stability for linear systems – Stability by Liapunov's direct method. (Ch. 11: § 59- 61)

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.

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GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016 -17 onwards)

CLASSICAL MECHANICS

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

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

UNIT - III 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 - 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. (Ch. 3: § 3.1-3.4)

UNIT - V 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:

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

REFERENCE:

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

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Sl. No.: | Subject Code: P16MM1E1

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016-17 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- II Connectivity, Euler tours and Hamilton cycles: Connectivity – Block – Euler tours – Hamilton cycles. Ch. 3: § 3.1 and Ch. 4: § 4.1-4.2)

UNIT- III 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- IV 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 - V 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.

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Sl. No.: | | **Subject Code:** | P16MM2C5 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016-17 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. 7 § 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"**.

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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 2016-17 onwards)

REAL ANALYSIS – II

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

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

UNIT-III **Sequence and series of functions:** Sequence of functions – Discussion of main problem – Uniform Convergence and Continuity – Uniform convergence and Integration – Uniform Convergence and Differentiation. (Ch. 7: pg no 143-152)

UNIT IV Equicontinuous families of functions – The Stone – Weierstrass theorem – Some special Functions - Power Series – The Exponential and Logarithmic Functions. (Ch. 7: pg no 154-165& Ch.8: 172 - 181)

UNIT-V Special Functions – The Trigonometric Functions - The Algebraic Completeness of the Complex Field - Fourier Series – The Gamma Function. (Ch. 8: pg no 182 - 196)

TEXT BOOK:

"Principles of mathematical Analysis" by Walter Rudin (3rd Edn), Tata McGraw-Hill

REFERENCES:

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 , **"An Introduction to classical Real Analysis"** Wadsworth, 1981

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GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016 -17 onwards)

COMPLEX ANALYSIS

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

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

UNIT - V **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. Karunakaran, "**Complex Analysis**", Narosa Publishing House, New Delhi, 2002.
5. R. V. Churchill, J. W. Brown, "**Complex Variables & Applications"**, Mc. Graw Hill, 1990.
6. John B. Conway, "**Functions of One Complex Variable"**. Narosa Publishing House, 2005.
7. Tristan Needham, **Visual Complex Analysis**, Oxford University Press. 1997.
8. Lars. V. Ahlfors, **Complex Analysis**, Third Edition, McGraw- Hill Book Company, Tokya, 1979.

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Sl. No.: | | **Subject Code:** | P16MM2C8 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016-17 onwards)

PARTIAL DIFFERENTIAL EQUATIONS

UNIT - I First order PDE – Curves and Surfaces – Genesis of First order PDE – Classification of Integrals - Linear Equations of the First order. (Ch. 1: § 1.1-1.4)

UNIT - II Pfaffian Differential Equations – Compatible Systems – Charpit's Method – Jacobi's Method. (Ch. 1: § 1.5-1.8)

UNIT - III Second order PDE: Classification of second order PDE: One-dimensional Wave equation – Vibrations of an Infinite string –Vibrations of a string of finite Length (Method of separation of variables). (Ch. 2: § 2.2,2.3 & 2.3.1,2.3.3)

UNIT - IV 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 (Ch. 2: § 2.4,2.4.1-2.4.5)

UNIT - V Heat Conduction Problem – Heat Conduction – Infinite Rod Case – Heat Conduction Finite Rod Case – Duhamel's Principle –Wave Equation – Heat Conduction Equation. (Ch. 2: § 2.5,2.5.1,2.5.2,2.6,2.6.1,2.6.2)

TEXT BOOK:

"An Elementary Course in Partial Differential Equations" by T. Amarnath , 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**.

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Sl. No.: | | **Subject Code:** | **P16MM2E2** |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016-17 onwards)

NUMERICAL METHODS

UNIT – I: Empirical relations and curve fitting: Equations reducible to linear form-Methods of moments-Method of Least squares-Fitting a straight line –Method of Least squares –Fitting a second degree parabola-Value of the sum of squares of Residuals - Conclusions. (Ch.2: § 2.1-2.6)

UNIT - II: Numerical solution of Algebraic and Transcendental Equation: Homer's Method –Muller Method- Chebyshev Method – Bairstow Method- Birge – Vieta Method – Solution of simultaneous non-linear Equation in two unknowns – Newton –Raphson Method. (Ch. § 3-3.2; 3.7,3.8,3.10-3.12)

UNIT - III: Solution of simultaneous Linear Algebraic Equations and Eigen value problems: Gauss –Jordan Elimination Method – Crout's Reduction Method - Power Method - Jacobi's Method - Given's Method.

(Ch: § 4-4.3,4.5,4.10-4.12)

UNIT - IV: Numerical Differentiation and Integration : Numerical Integration-Newton-cote's Quadrature Formula – Romberg's Method- Gauss's Quadrature Formula - Gauss – Legendre Integration Method .

(Ch:8 § 8.8,8.9,8.10,8.11,8.12)

UNIT - V: Numerical solution of Partial Differential Equation: Classification of Partial Differential Equations of the second order – Difference Equation corresponding to Laplace Equation -Liebmann's Iteration Process - Bender – Schmidt Difference Equation corresponding to the parabolic Equation.

(Ch:11: § 11.1-11.4)

TEXT BOOK:

"**Numerical Methods with programming in C**" Prof.T.Veerarajan and Dr.T.Ramachandran.

REFERENCE BOOK

1. **Elementary Numerical Analysis** – Samuel D.Conte Cal De Boor.
2. **Numerical Methods**-Dr.P.Kandasamy, Dr.K.Thilagavathy, Dr.K.Gunavathi.
3. R.L.Burden ,J.Douglas Faires,"**Numerical Analysis**",Thompson Books,USA,2005.
4. S.S.Sastry,"**Introductory Methods of Numerical Analysis**",Prentice Hall of India Private Limited,New Delhi-2001.

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

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Sl. No. | **Subject Code:** P16MM3C9

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016-17 onwards)

FUNCTIONAL ANALYSIS

UNIT – I **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 – II **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: § 52-58)

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

UNIT – IV **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 – V **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. **"An introduction to Topology and Modern Analysis"**, G. F. Simmons, McGraw Hill Company.

REFERENCE BOOKS:

1. **"Functional Analysis"**,V.K.Krishnan .
2. **"Functional Analysis"**, M.Thamban Nair.
3. **"Functional Analysis",** B. V. Limaye, Wiley Eastern Ltd, Bombay.
4. **"Functional Analysis"**, K. Yasodha, Springer Verlag, 1974.

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Sl. No. | **Subject Code:** P16MM3C10

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016-17onwards)

INTEGRAL EQUATIONS, CALCULUS OF VARIATION AND FOURIER TRANSFORMS

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

UNIT-III 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 : IV 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. (Ch. 1)

UNIT-V Reduction to a Algebraic Equations – Examples – Fedholm alternative – Examples – An Approximate method. (Ch 2[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 Mandiar Pvt. Ltd.

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Sl. No.: | | **Subject Code:** | **P16MM3C11** |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016-17 onwards)

TOPOLOGY

UNIT- I Topological spaces : Topological spaces - Basis for a topology - The order Topology-The Product Topology and X×Y. (Ch. 2: § 12-15)

UNIT II The subspace Topology – Closed set and limit Points continuous functions - The Product Topology. (Ch. 2: § 16-19)

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

UNIT- V Countability axioms – The separation axioms – Normal spaces – (The Urysohn lemma,The Urysohn metrization theorem,Tietze Extension Theorem) Statement only. (Ch. 4: § 30-35)

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.

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Sl. No.: | | **Subject Code:** | P16MM3E3 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016-17 onwards)

ADVANCED OPERATIONS RESEARCH

UNIT : I 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.11:§ 11.1-11.4)

UNIT : II Dynamic programming – Bellman's Principle of Optimality - Characteristics of a dynamic programming –Solutions of discrete D.P.P - Solution of L.P.P using Dynamic Programming approach. (Ch.12: § 12.1,12.3,12.5,12.6)

UNIT : III 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 . (Ch.17: §17.1-17.8)

UNIT : IV 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. (Ch.18: § 18.1-18.7)

UNIT : V Network Scheduling by CPM/PERT – Network basic components – Rules of Network construction – CPM – Types of Floats – Critical path – Cost slop– Probability consideration in PERT – Distinction between PERT and CPM. (Ch.21: § 21.1-21.8)

Text Book:

Kanti Swarup, P.K. Gupta & Man Mohan – **Operations Research**, Sultan chand & sons, 13th Edition.

Reference Books:

1. H.A. Taha – "**Operations Research: An Introduction**", 6th Edition, Macmillan.
2. F.S. Hiller & G.J. Lieberman, "**Introduction to Mathematical Programming"**, McGraw – Hill International Edition.

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Sl. No.: | | **Subject Code:** | P16MM3E4 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016-17 onwards)

PROBABILITY AND STOCHASTIC PROCESSES

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

UNIT : IV 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 : V 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

REFERENCES:

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

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Sl. No. | **Subject Code:** P16MM4C12

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016-17 onwards)

THEORY OF NUMBERS

UNIT-I 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-II 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-III Number theory from an algebraic view point- Groups, Rings and Fields- Quadratic Residues- The Legendre symbol (a/r) where r is an odd prime- Quadratic reciprocity. (Ch.2: § 2.10,2.11& Ch.3: §3.1-3.2)

UNIT-IV The Jacobi symbol (p/q) where q is an odd positive integer, Binary Quadratic forms- Equivalence and reduction of Binary Quadratic forms- Sums of two squares – Positive definite binary quadratic forms. (Ch.3: § 3.3-3.7)

UNIT-V Greatest integer function- Arithmetic functions- The Mobius inversion formula- Recurrences functions- Combinatorial number theory. (Ch.4:4.1 – 4.5)

TEXT BOOK:

Ivan Niven, Herbert.S, Zukerman and Hughl, Montgomery, **"An Introduction to the Theory of Numbers"**, Fifth Edition John Wiley and Sons, Inc, 2004.

REFERENCE BOOKS:

1. David M. Burton, **"Elementary number theory"**, W. M. C. Brown publishers, Dubuque, Lawa, 1989.
2. George Andrews, **"Theory of Numbers"**.
3. **"Fundamentals of Number Theor"y**, William .J. Leveque, Addition-Wesley publishing company, Phillipines, 1977.

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Sl. No. | | **Subject Code:** | **P16MM4C13**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016-17 onwards)

DIFFERENTIAL GEOMETRY

UNIT – I **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 – II **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 – III **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 – IV **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 – V **Differential Geometry of surfaces:** Introduction- Compact surfaces whose points are umblics – Hilbert's lemma - Compact surface of constant Guassian or Mean curvature – complete surface –characterization of Complete Surfaces - Hilbert's theorem – Conjugate points on geodesics.
(Ch. 4: § 1-8)

TEXT BOOK:

D. Somasundaram, **"Differential Geometry"**,Narosa Publishing House, 2014.

REFERENCE BOOK:

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

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Sl. No. | | **Subject Code:** | **P16MM4C14** |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016-17 onwards)

MEASURE THEORY AND INTEGRATION

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

UNIT – II **Integration of Non-negative functions:** The general integral – Integration of series – Riemann and Lebesgue integrals. (Ch. 3: § 3.1-3.4[1])

UNIT – III **Abstract measure spaces:** Measures and outer measures – Completion of Measures – Measure spaces – Integration with respect to measure. (Ch. 5: § 5.1,5.4-5.6[1])

UNIT – IV **Convergence in measure:** Almost uniform convergence – Signed measure and the Hahn decomposition – The Jordan decomposition – Radon-Nikodym Theorem. (Ch. 7: § 7.1 – 7.2 & Ch. 8: § 8.1 – 8.3[1])

UNIT – V **The Classical Banach spaces:** L^P spaces – Minkowski and Holder's inequality – Completeness – Approximation in L^P spaces. (Ch. 6: [2])

TEXT BOOKS:

1. G. de. Barra. **"Measure theory and integration"**, New Age International(P) Ltd.
2. H. L. Royden, **"Real Analysis"**, 3rd Edition, PHI Ltd.

REFERENCE BOOKS:

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

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Sl. No. | **Subject Code:** P16MM4E5

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from the year 2016-17 onwards)

FLUID DYNAMICS

UNIT I **Kinematics of fluids in motion:** Real fluids and ideal fluids-Velocity of a fluid at a point, streamlines-path lines-steady and unsteady flows, velocity potential-the vorticity vector-local and particle rates of changes-equations of continuity-examples. (Ch 2: 2.1-2.8)

UNIT II **Equations of motion of a fluid:** Pressure at a point in a fluid at rest-Pressure at a point in a moving fluid-Condition at a boundary of two inviscid immiscible fluids, Euler's equation of motion-Discussion of the case of steady motion under conservative body forces. (Ch 3: 3.1-3.4 & 3.7)

UNIT III **Some three & Two dimensional flows:**Introduction-Sources-Sinks and doublets-Images in a rigid infinite plane-Axis symmetric flows-Stoke's stream function - Two-dimensional flows-Meaning of two-dimensional flow-Use of cylindrical polar co-ordinates-The stream function.
(Ch 4: 4.1-4.3,4.5& Ch:5 5.1 – 5.3)

UNIT IV **Viscous flows:**Viscous flows-Stress components in a real fluid-Relation between Cartesian components of stress-Translation motion of fluid elements - The rate of strain quadric and principle stresses- Further properties of the rate of strain quadric. (Ch 8: 8.1-8.5)

UNIT V Stress analysis in fluid motion-Relation between stress and rate of strain-The co-efficients of viscosity and laminar flow-The Navier-Stoke's equations of motion of a viscous fluid. (Ch 8: 8.6-8.9)

TEXT BOOK: F.Chorlton, "**Fluid Dynamics"**, CBS publications, New Delhi,1985.

REFERENCE BOOKS:

1.G.K.Batchaclor, **An introduction to fluid mechanics** ,foundation books.

2.S.W.Yuan, **Foundation of fluid mechanics**, Prentice Hall of India Pvt.Ltd

3.R.K.Rathy, **An introduction to fluid dynamics**, IBH publishing company.

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Sl. No.: | | **Subject Code:** | **P16MM4PW** |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

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

(For the candidates admitted from 2016-17 onwards)

PROJECT WORK

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

PASSING MINIMUM – 50 MARKS

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