



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS
M.Sc - Mathematics (Full Time)
Curriculum and Syllabus
2017 Regulation

I SEMESTER						
S.No	Sub. Code	Title of Subject	L	T	P	C
1	HMMA17001	Real Analysis	4	0	0	4
2	HMMA17002	Linear Algebra	4	0	0	4
3	HMMA17003	Advanced Numerical Analysis	4	0	0	4
4	HMMA17004	Ordinary Differential Equations	4	0	0	4
TOTAL			16	0	0	16

II SEMESTER						
S.No	Sub. Code	Title of Subject	L	T	P	C
1	HMMA17005	Complex Analysis	4	0	0	4
2	HMMA17006	Partial Differential Equations	4	0	0	4
3	HMMA17007	Mechanics	4	0	0	4
4	HMMA17008	Mathematical Statistics	4	0	0	4
TOTAL			16	0	0	16

III SEMESTER						
S.No	Sub. Code	Title of Subject	L	T	P	C
1	HMMA17009	Functional Analysis	4	0	0	4
2	HMMA17010	Calculus Of Variations And Integral Equations	4	0	0	4
3	HMMA17EXX	Elective I	4	0	0	4
4	HMMA17EXX	Elective II	4	0	0	4
TOTAL			16	0	0	16

IV SEMESTER						
S.No	Sub. Code	Title of Subject	L	T	P	C
1	HMMA17011	Topology	4	0	0	4
2	HMMA17012	Optimization Techniques	4	0	0	4
3	HMMA17EXX	Elective III	4	0	0	4
4	HMMA17EXX	Project	0	0	15	15
TOTAL			12	0	15	27

Credit Summary

1st Semester - 16

2nd Semester - 16

3rd Semester - 16

4th Semester - 27

Total No. of Credits - 75



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

LIST OF ELECTIVES						
S.No	Sub. Code	Title of Subject	L	T	P	C
1	HMMA17E01	Mathematical Modeling & Applications	4	0	0	4
2	HMMA17E02	Fluid Dynamics	4	0	0	4
3	HMMA17E03	Probability Theory & Stochastic Processes	4	0	0	4
4	HMMA17E04	Modern Applied Algebra	4	0	0	4
5	HMMA17E05	Fuzzy Sets And Fuzzy Logic	4	0	0	4
6	HMMA17E06	Statistical Quality Control	4	0	0	4
7	HMMA17E07	Graph Theory	4	0	0	4
8	HMMA17E08	Discrete Mathematics	4	0	0	4



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal, Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17001

REAL ANALYSIS

4 0 0 4

OBJECTIVES:

- ❖ To give an in-depth knowledge of Real Analysis and their applications.
- ❖ To train the students in problem solving in Real Analysis.

UNIT I

12 Hours

Finite, Countable and Uncountable Sets – Metric spaces – Compact sets – Perfect sets – Connected sets. Numerical Sequences and Series: Sequences – Convergence – Subsequences - Cauchy Sequences – Upper and Lower Limits - Some Special Sequences – Tests of convergence – Power series – Absolute convergence – Addition and multiplication of series – Rearrangements.

(Chapters 2 and 3)

UNIT II

12 Hours

Limits of functions – Continuous functions – continuity and Compactness – Continuity and connectedness – Discontinuities – Monotonic functions – Infinite limits and limits at infinity. Differentiation: Derivative of a real function – Mean value Theorems - Intermediate value theorem for derivatives – L'Hospital's Rule – Taylor's Theorem – Differentiation of vector valued functions.

(Chapters 4 and 5)

UNIT III

12 Hours

Definition and Existence – Properties – Integration and Differentiation – Integration of vector valued functions.

(Chapter 6)

UNIT IV

12 Hours

Uniform Convergence and Continuity – Uniform Convergence and Differentiation – Equicontinuous families of functions – The Stone – Weierstrass Theorem. (Chapter 7)

UNIT V

12 Hours

Linear Transformations - Differentiation – The Contraction Principle – The Inverse Function Theorem - The Implicit Function Theorem. (Chapter 9, Sections 9.1 to 9.29)

Total No. of hours: 60

TEXT BOOKS:

1. Walter Rudin (1976) *Principles of Mathematical Analysis*, Third Edition, Mcgraw Hill.

REFERENCES:

1. Apostol, T.M (1985)*Mathematical Analysis*, Narosa.
2. White, A.J (1968) *Real Analysis : An Introduction*, Addison Wesley Publishing Co.
3. Serge Lang (1969)*Analysis I & II*, Addison-Wesley Publishing Company, Inc.
4. Carothers, N.L (2013)*Real Analysis*, Cambridge University press, Indian edition.



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17002

LINEAR ALGEBRA

4 0 0 4

OBJECTIVES

- ❖ To give an in-depth knowledge of Algebra and their applications.
- ❖ To train the students to write definition and problem solving in Algebra.

UNIT I

12 Hours

Vector Spaces – Subspaces – Linear Independence and Dependence – Basis and Dimension – Sum of subspaces - Coordinates.

UNIT II

12 Hours

Linear Transformations – The Algebra of Linear Transformations – Isomorphism – Representation of Transformations by Matrices – Linear Functionals.

UNIT III

12 Hours

Characteristic Values – Annihilating Polynomials – Invariant Subspaces – Direct Sum decompositions – Invariant direct sums – Primary Decomposition Theorem.

UNIT IV

12 Hours

Cyclic Subspaces and Annihilators – Cyclic Decomposition and the Rational Form – The Jordan Canonical form.

UNIT V

12 Hours

Inner product spaces – Orthogonal complement – Linear functionals and Adjoint – Unitary operators – Normal operators.

Total No. of hours: 60

TEXT BOOKS:

1. Kenneth Hoffman, Ray Kunze (1996)*Linear Algebra*, Prentice Hall India.

REFERENCES:

1. Finkbeiner, D.T (1978)*Introduction to Matrices and Linear Transformations*, W.H.Freeman& Co.
2. VivekSahai, Vikas Bhat (2002) *Linear Algebra*, Narosa.



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17003

ADVANCED NUMERICAL ANALYSIS

4 0 0 4

Objectives

- ❖ To know the theory behind various numerical methods.
- ❖ To apply these methods to solve mathematical problems.

UNIT I

12 Hours

Rate of convergence – Secant Method, Regula Falsi Method, Newton Raphson Method, Muller Method and Chebyshev Method. Polynomial equations: Descartes’ Rule of Signs - Iterative Methods: Birge-Vieta method, Bairstow’s method Direct Method: Graeffe’s root squaring method. (Chapter 2 § 2.5 [Pages 41-52], 2.9 [Pages 83-99])

UNIT II

12 Hours

Error Analysis of Direct methods – Operational count of Gauss elimination, Vector norm, Matrix norm, Error Estimate. Iteration methods - Jacobi iteration method, Gauss Seidel Iteration method, Successive Over Relaxation method - Convergence analysis of iterative methods, Optimal Relaxation parameter for the SOR method. Finding eigen values and eigen vectors – Jacobi method for symmetric matrices and Power methods only. (Chapter 3 § 3.3[Pages 134-140], 3.4[Pages 146-164], 3.5[Pages 170-173], 3.7 [Pages179-185] and 3.11 [Pages 196-198]).

UNIT III

12 Hours

Hermite Interpolations, Piecewise and Spline Interpolation: piecewise linear interpolation, piecewise quadratic interpolation, piecewise cubic interpolation, spline interpolation-cubic Spline interpolation. Bivariate Interpolation-Lagrange Bivariate interpolation. Least square approximation. (Chapter 4 § 4.5 - 4.7 & 4.9 [Pages 284-290])

UNIT IV

12 Hours

Numerical Differentiation – Optimum choice of Step length – Extrapolation methods – Partial Differentiation. Numerical Integration: Methods based on undetermined coefficients - Gauss Legendre Integration method and Lobatto Integration Methods only. (Chapter 5 § 5.2 - 5.5[Pages 320-345] and 5.8[pages 361 – 365 and 380-386])

UNIT V

12 Hours

Local truncation error or Discretization Error, Order of a method, Taylor Series method, Runge-Kutta methods: Explicit Runge–Kutta methods– Minimization of Local Truncation Error, System of Equations, Implicit Runge-Kutta methods. Stability analysis of single step methods (RK methods only). (Chapter 6 §6.4[Pages 434-459]and 6.5[Pages 468-475])

Total No. of hours: 60

TEXT BOOKS:

1. Jain, M.K Iyengar, S.R.K. Jain, R.K. (2012) *Numerical Methods for Scientific and Engineering Computation*, New Age International (p) Limited Publishers.

REFERENCES:

1. Kendall E. Atkinson, (1988) *An Introduction to Numerical Analysis*, II Edn., John Wiley & Sons.
2. Jain, M.K. (1983) *Numerical Solution of Differential Equations*, II Edn., New Age International Pvt Ltd.
3. Samuel. D. Conte, Carl. De Boor, (1983)*Elementary Numerical Analysis*, Mc Graw-Hill International Edn..



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17004

ORDINARY DIFFERENTIAL EQUATIONS

4 0 0 4

Objectives:

- ❖ To give an in-depth knowledge of differential equations and their applications.
- ❖ To train the students to solve the problems in ODE.

UNIT I

12 Hours

Linear Equations with constant coefficients – Initial value problems for second order equations – Linear Dependence and Independence – Wronskian – Non-homogeneous Equation of order two – Homogeneous Equation of order n – Initial Value Problems for n -th order Equations – Non-Homogeneous Equation of order n

UNIT II

12 Hours

Linear Equations with Variable Coefficients – Initial value problems and Solutions for the Homogeneous equation – Wronskian and Linear independence – Reduction of the order – Non-Homogeneous equation – Homogeneous equations with Analytic coefficients – Legendre Equation.

UNIT III

12 Hours

Euler Equation – Second order equations with regular singular points – Convergence Proof – Bessel Equation – Regular singular points at infinity.

UNIT IV

12 Hours

Existence and Uniqueness of Solutions to First Order Equations: Equations with Variables Separated – Exact Equations – The Method of Successive Approximations – The Lipschitz Condition – Convergence of Successive Approximations.

UNIT V

12 Hours

Existence and Uniqueness of Solutions to Systems and n -th Order Equations: Example of Central forces and Planetary motion – Some special equations – System of Vector equations – Existence and Uniqueness of solutions to systems – Equations of Order n .

Total No. of hours: 60

TEXT BOOKS:

1. Coddington, E.A (1998)*An Introduction to Ordinary Differential Equations*,Prentice Hall –India.

REFERENCES:

1. Simmons, G.F (1997)*Differential Equations with Applications and Historical Notes*, Tata McGraw Hill.



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17005

COMPLEX ANALYSIS

4 0 0 4

Objectives:

- ❖ To give an in-depth knowledge of Complex Analysis and their applications.
- ❖ To train the students to solve the problems in Complex Analysis.

UNIT I

12 Hours

Analytic Functions – Functions,Limits,Continuity and Differentiability – Power Series as an Analytic Function – Exponential and Trigonometric Functions – Complex Logarithms – Inverse Functions – Zeroes of Analytic Functions. (pp.83 – 100, 111-136 and 145-178 of the Text)

UNIT II

12 Hours

Complex Integration – Curves in the Complex Plane – Basic Properties of Complex Integrals – Winding Number of a Curve – Cauchy-Goursat Theorem – Homotopy Version – Morera's Theorem-Cauchy Integral Formula . (pp.191 – 258 of the Text)

UNIT III

12 Hours

Laurent's Series – The Maximum Modulus Principle – Schwarz Lemma – Application to Conformal Mapping - Liouville's Theorem – Gauss Theorem – Lucas Theorem. (pp. 259 – 300 of the Text)

UNIT IV

12 Hours

Isolated and Non-isolated Singularities - Removable Singularity – Poles –Singularities at Infinity - Residue at a Finite Point – Residue at the Point at Infinity – Residue Theorem. (pp.313 – 335, pp.347 – 375 of the Text)

UNIT V

12 Hours

Number of Zeroes and Poles – Rouché's Theorem – Evaluation of certain Real Integrals – Singularities on the Real Axis. (pp. 376 – 397, 407 – 445 of the Text)

Total No. of hours: 60

TEXT BOOKS:

1. Ponnusamy, S (2000)*Foundations of Complex Analysis*, Narosa Pub.

REFERENCES:

1. Ahlfors, L.V (1979)*Complex Analysis*, McGraw Hill.
2. Brown, J.WChurchill, R.V (1996)*Complex Variables And Applications*, McGraw Hill.



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17006

PARTIAL DIFFERENTIAL EQUATIONS

4 0 0 4

Objectives:

- ❖ To give an in-depth knowledge of Partial Differential equations and their applications.
- ❖ To apply them in scientific and engineering problems.

UNIT I

12 Hours

Introduction – Classification of Second Order PDE – Canonical Forms – Laplace Equation - Separation of Variables – Dirichlet and Neumann Problems for a Rectangle – Interior and Exterior Dirichlet Problems for a Circle – Interior Neumann Problem for a Circle – Solutions of Laplace Equation in Cylindrical and Spherical Polar Coordinates – Examples.

(pp.1-16, pp.47-98 of the Text)

UNIT II

12 Hours

Parabolic Equations – Diffusion Equation – Boundary Conditions – Elementary Solutions – Dirac Delta Function – Separation of Variables – Solution of Diffusion Equation in Cylindrical and Spherical Coordinates – Maximum – Minimum Principle and Consequences – Examples. (pp.101-140 of the Text-Book)

UNIT III

12 Hours

Hyperbolic Equations – Wave Equation – Solution by Canonical Reduction – De Alemberts Solution – Variables Separable Solution – Forced Vibrations – Periodic Solutions in Cylindrical and Spherical Coordinates – Boundary and Initial Value Problem for Two-Dimensional Wave Equation – Method of Eigen Functions – Vibration of a Circular Membrane – Examples.

(pp.144-169, pp.173-181 of the Text-Book)

UNIT IV

12 Hours

Laplace Transform Methods- Introduction- Transforms of some Elementary Functions- Properties of Laplace Transform – Transforms of Periodic-, Error-, Bessel-, Unit Step-and Dirac Delta Functions – Inverse Transform – Convolution Theorem – Complex Inversion Formula – Solutions of Ordinary- and Partial differential Equations- Solutions of Diffusion Equation and Wave Equation. (pp.214-266 of the Text-Book)

UNIT V

12 Hours

Fourier Transform Methods-Introduction – Fourier Integral Theorem – Sine and Cosine Integrals – Fourier Transform Pairs – Transforms of Elementary Functions and Dirac Delta Function – Properties of Fourier Transform- Convolution Theorem – Parseval's Relation – Finite Fourier Transforms – Finite Sine and Cosine Transforms – Solutions of Diffusion Equation, Wave Equation and Laplace Equation – Examples. (pp.278-302, 304-327 of the Text-Book)

Total No. of hours: 60

TEXT BOOKS:

1. Sankara Rao (2003)*Introduction To Partial Differential Equations*, Prentice-Hall of India.

REFERENCES:

1. Copson, E.T. (1976) *Partial Differential Equations*, S.Chand&Co.
2. Sneddon, I.N.(1986)*Elements of Partial Differential Equations*, McGraw Hill.



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal, Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17007

MECHANICS

4 0 0 4

OBJECTIVES:

- ❖ To give an in-depth knowledge of Mechanics and their applications.
- ❖ To apply them in scientific and engineering problems.

UNIT I

12 Hours

The Mechanical system - Generalized coordinates - Constraints - Virtual work - Energy and Momentum
(Chapter 1: Sections 1.1 to 1.5)

UNIT II

12 Hours

Derivation of Lagrange's equations- Examples - Integrals of motion.
(Chapter 2: Sections 2.1 to 2.3 [Omit Section 2.4])

UNIT III

12 Hours

Hamilton's Principle - Hamilton's Equation - Other variational principle.
(Chapter 4: Sections 4.1 to 4.3 [Omit section 4.4])

UNIT IV

12 Hours

Hamilton Principle function - Hamilton-Jacobi Equation - Separability
(Chapter 5: Sections 5.1 to 5.3)

UNIT V

12 Hours

Differential forms and generating functions - Special Transformations - Lagrange and Poisson brackets.
(Chapter 6: Sections 6.1, 6.2 and 6.3 [omit sections 6.4, 6.5 and 6.6])

Total No. of hours: 60

TEXT BOOKS:

1. Greenwood D.T (1995), *Classical Dynamics*, Prentice Hall of India, New Delhi.

REFERENCES:

1. H. Goldstein, *Classical Mechanics*, (2nd Edition) Narosa Publishing House, New Delhi.
2. Rane N.C, Joag P.S.C (1991), *Classical Mechanics*, Tata McGraw Hill.



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17008

MATHEMATICAL STATISTICS

4 0 0 4

Objectives:

- ❖ To give an in-depth knowledge of Mathematical Statistics and their applications.
- ❖ To apply them in scientific and engineering problems.
- ❖ To train the students to solve the problems in Mathematical Statistics.

UNIT I

12 Hours

Notion of a sample and a statistic - Distribution functions of X , S^2 and (X, S^2) - χ^2 distribution - Student t-distribution - Fisher's Z - distribution - Snedecor's F - distribution - Distribution of sample mean from non-normal populations. (Chapter 9: Sections 9.1 to 9.8)

UNIT II

12 Hours

Concept of a statistical test - Parametric tests for small samples and large samples - χ^2 test - Kolmogorov Theorem 10.11.1 - Smirnov Theorem 10.11.2 - Tests of Kolmogorov and Smirnov type - The Wald-Wolfovitz and Wilcoxon - Mann-Whitney tests - Independence Tests by contingency tables. (Chapter 10: Sections 10.11; Chapter 11: 12.1 to 12.7)

UNIT III

12 Hours

Preliminary notion - Consistency estimation - Unbiased estimates - Sufficiency - Efficiency - Asymptotically most efficient estimates - methods of finding estimates - confidence Interval. (Chapter 13: Sections 13.1 to 13.8 [Omit Section 13.9])

UNIT IV

12 Hours

One way classification and twoway classification. Hypotheses Testing: Power functions - OC function - Most Powerful test - Uniformly most powerful test - unbiased test. (Chapter 15: Sections 15.1 and 15.2 [Omit Section 15.3]; Chapter 16: Sections 16.1 to 16.5 [Omit Section 16.6 and 16.7])

UNIT V

12 Hours

SPRT - Auxiliary Theorem - Wald's fundamental identity - OC function and SPRT - $E(n)$ and Determination of A and B - Testing a hypothesis concerning p on 0-1 distribution and m in Normal distribution. (Chapter 17: Sections 17.1 to 17.9 [Omit Section 17.10])

Total No. of hours: 60

TEXT BOOKS:

1. Fisz, M. (1963) *Probability Theory and Mathematical Statistics*, John Wiley and sons, New York.

REFERENCES:

1. Dudewicz, E.J. Mishra, S.N. (1988) *Modern Mathematical Statistics*, John Wiley and Sons, New York.
2. Rohatgi, V.K. (1988) *An Introduction to Probability Theory and Mathematical Statistics*, Wiley Eastern New Delhi, (3rd Edn)
3. Roussas, G.G. (1973) *A First Course in Mathematical Statistics*, Addison Wesley Publishing Company.
4. VanderWaerden, B.L. (1968) *Mathematical Statistics*, G.Allen & Unwin Ltd., London.

HMMA17009

FUNCTIONAL ANALYSIS

4 0 0 4



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

Objectives

To give an in-depth knowledge of Metric Space, Normed Space and Some Named theorem
To train the students to solve the problems in Functional Analysis

UNIT I

12 Hours

Metric Space – Examples – Open Set, Closed Set, Neighbourhood – Convergence, Cauchy Sequence, Completeness – Examples – Completeness Proofs – Completion of Metric Spaces. (pp. 1 – 45 of the Text)

UNIT II

12 Hours

Normed Space – Banach Space – Properties of Normed Spaces – Finite dimensional Normed Spaces and Subspaces – Compactness and Finite Dimension – Linear Operators – Bounded and Continuous Linear Operators – Linear Functionals – Linear Operators and Functionals on Finite Dimensional Spaces – Normed Spaces of Operators – Dual Space. (pp. 58 – 125 of the Text)

12 Hours

UNIT III

Inner Product Space – Hilbert Space – Properties of Inner Product Spaces – Orthogonal Complements and Direct Sums – Orthonormal Sets and Sequences – Representation of Functionals on Hilbert Spaces – Hilbert Adjoint Operator – Self-Adjoint, Unitary and Normal Operators. (pp. 128 - 174, 188 - 206 of the Text)

UNIT IV

12 Hours

Hahn-Banach Theorem – Application to Bounded Linear Functionals on $C[a,b]$ – Adjoint Operator – Reflexive Spaces – Category Theorem – Uniform Boundedness Theorem – Strong and Weak Convergence – Convergence of Sequences of Operators and Functionals – Open Mapping Theorem – Closed Linear Operators – Closed Graph Theorem. (pp. 213 – 268, 285 – 295 of the Text)

UNIT V

12 Hours

Basic Concepts of Spectral Theory in Finite Dimensional Normed Spaces - Spectral Properties of Bounded Self-Adjoint Linear Operators in Hilbert Spaces – Positive Operators – Square Roots of a Positive Operator – Projection Operators – Properties of Projections – Spectral Family – Spectral Representation – Extension of Spectral Theorem to Continuous Functions . (pp. 370 - 378, 459 – 516 of the Text)

Total No. of hours: 60

TEXT BOOKS:

1. Erwin kreyszig (2003) *Introductory Functional Analysis with Applications*, John Wiley.

REFERENCES:

1. Simmons, G.F (1963)*Introduction to Topology and Modern Analysis*, McGraw Hill.
2. Bachmann, G. Narici, L (1966)*Functional Analysis*, Academic Press.
3. Ponnusamy, S (2003)*Functional Analysis*, NarosaPub.House.
4. Thamban Nair (2002), *Functional Analysis –A First Course*, PHI.



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal, Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17010

CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS

4 0 0 4

Objectives

To give an basic knowledge of Definitions, theorems and their applications.

To apply them in scientific and engineering problems.

To train the students to solve the problems in Calculus of Variations and integral equations.

UNIT I

12 Hours

The concept of Variation and its properties – Euler’s equation – Variational problems for functional – Functionals dependent on higher order derivatives – Functions of several independent variables – Some applications to problems of mechanics. (Chapter 1: 1.1 to 1.7)

UNIT II

12 Hours

Movable boundary for a functional dependent on two functions – One sided variations – Reflection and Refraction of extremals – Diffraction of light rays. (Chapter 2: 2.1 to 2.5)

UNIT III

12 Hours

Integral equations: Introduction – Definition – Regularity conditions – Special kinds of Kernals – Eigen values and eigen functions – Convolution integral – Reduction to a system of algebraic equations – Examples – Fredholm alternative – Examples – An approximation method. (Chapter 1: 1.1 to 1.5 Chapter 2 : 2.1 to 2.5)

UNIT IV

12 Hours

Method of successive approximations – Iterative scheme – Examples – Volterra integral equations – Examples – Some results about the resolvent kernel – The method of solution of Fredholm equation – Fredholm first theorem – Examples. (Chapter 3: 3.1 to 3.5 Chapter 4: 4.1 to 4.3)

UNIT V

12 Hours

Initial value problems – Boundary value problems – Examples – Singular integral equations – The Abel integral equations - Examples. (Chapter 5: 5.1 to 5.3 Chapter 8: 8.1 to 8.2)

Total No. of hours: 60

TEXT BOOKS:

1. Gupta, A.S. (2005) *Calculus of Variations with Applications*, PHI, New Delhi, 2005. (for Units I and II)
2. Ram P. Kanwal (1971) *Linear Integral Equations, Theory and Techniques*, Academic Press, New York. (for Units III, IV and V)

REFERENCES:

1. Raisinghania, M.D. (2007) *Integral Equations and Boundary Value Problems*, S. Chand & Co., New Delhi.
2. Sudir K. Pundir, RimplePundir (2005) *Integral Equations and Boundary Value Problems*, PragatiPrakasam, Meerut.



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17011

TOPOLOGY

4 0 0 4

Objectives

To give an in-depth knowledge of Topological spaces and their applications.

To train the students to develop analytical thinking and the study of continuity and connectivity.

UNIT I

12Hours

Topological spaces - Basis for a topology - The order topology - The product topology on $X \times Y$ - The subspace topology - Closed sets and limit points. (Chapter 2: Sections 12 to 17)

UNIT II

12 Hours

Continuous functions - the product topology - The metric topology.
(Chapter 2: Sections 18 to 21 [Omit Section 22])

UNIT III

12 Hours

Connected spaces - connected subspaces of the Real line - Components and local connectedness.
(Chapter 3: Sections 23 to 25)

UNIT IV

12 Hours

Compact spaces - compact subspaces of the Real line - Limit Point Compactness - Local Compactness.
(Chapter 3: Sections 26 to 29)

UNIT V

12 Hours

The Countability Axioms - The separation Axioms - Normal spaces - The Urysohn Lemma - The Urysohn metrization theorem - The Tietz extension theorem. (Chapter 4: Sections 30 to 35)

Total No. of hours: 60

TEXT BOOKS:

1. Munkres, J.R (2002) *Topology* (2nd Edition) Pearson Education Pvt. Ltd., Delhi.

REFERENCES:

1. Dugundji, J (1975) *Topology*, Prentice Hall of India, New Delhi.
2. George F.Sinmons (1963), *Introduction to Topology and Modern Analysis*, McGraw Hill Book Co.
3. Kelly, J.L *General Topology*, Van Nostrand, Reinhold Co., New York
4. Willard, S (1970) *General Topology*, Addison - Wesley, Mass.



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17012

OPTIMIZATION TECHNIQUES

4 0 0 4

Objectives

To give an in-depth knowledge of Optimization Techniques and their applications.
To train the students to Solve the problems in Optimization Techniques.

UNIT I

12 Hours

Introduction to Optimization – Classical Optimization Theory – Unconstrained Problems – Necessary and Sufficient Conditions – The Newton-Raphson Method – Constrained Problems Equality Constraints – Inequality Constraints.
(Ch.20 pp.701-730)

UNIT II

12 Hours

Introduction to Linear Programming – Two-Variable LP Model – Graphical Solution – Solutions of Maximization and Minimization Models – Simplex Method – Computational Details of the Simplex Algorithm - M-Method –Two-phase Method- Degeneracy. (Ch.2 pp. 11-20, Ch.3 pp. 80-83, 94-105)

UNIT III

12 Hours

Transportation Model – Definition – Determination Of The Starting Solution – Iterative Computations of the Transportation Algorithm- Simplex Method Explanation of the Method of Multipliers – The Assignment Model – The Hungarian Method – Simplex Explanation of the Hungarian Method – The Transshipment Model . (Ch.5 pp.165- 186, 195-208)

UNIT IV

12 Hours

Integer Linear Programming – Illustrative Applications – Branch-and-Bound Algorithm – Cutting Plane Algorithm – Traveling Salesperson Problem – B&B Solution Algorithm.(Ch.9 pp.361-378, 384-397)

UNIT V

12 Hours

Deterministic Dynamic Programming – Recursive Nature of Computations in DP – Forward and Backward Recursion – Cargo-Loading Model – Workforce Size Model – Equipment Replacement Model – Investment and Inventory Models . (Ch. 10 pp.401-425)

Total No. of hours: 60

TEXT BOOKS:

1. Taha, H.A (2002)*Operations Research- An Introduction*, Prentice Hall India.

REFERENCES:

1. Hillier, Lieberman (2001)*An Introduction to Operations Research*, McGrawHill,
2. Wagner, H.M (2000)*Principles of Operations Research*, Prentice-Hall India,.
3. Nocedal, Wright, (2003)*Numerical Optimization*, Springer.
4. Gupta, P.K Man Mohan (2001)*Problems in Operations Research*, Sultan Chand,



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17E01

MATHEMATICAL MODELING AND APPLICATIONS

4 0 0 4

Objectives

To give an in-depth knowledge of Mathematical Modeling and their applications.

To train the students to solve the problems in Mathematical Modeling.

UNIT I

12 Hours

Introduction to Mathematical Modeling- Mathematical Modeling through Ordinary Differential Equations – Linear ,Non-linear Growth and Decay- Compartment Models – Models Through Systems of Ordinary Differential Equations- Models in Population Dynamics –Modeling of Epidemics – Modeling in Economics – Modeling through Linear Differential Equations of Second Order.(Ch.1 pp.01-13, Ch.2 pp.30-43, Ch.3 pp. 53-69, Ch.4 pp. 88-93 of Book 1)

UNIT II

12 Hours

Modeling through Difference Equations – Some Simple Models – Basic Theory of Linear Difference Equations with Constant Coefficients – Models in Economics and Finance-Models in Population Dynamics and Genetics –Models in Probability Theory .(Ch.5 pp.96 – 121 of Book 1)

UNIT III

12 Hours

Partial Differential Equations – Initial and Boundary Conditions - Modeling through Partial Differential Equations – Mass Balance Equations – Momentum Balance Equations – Variational Principles – Probability Generating Function – Model for Traffic Flow. (Ch. 6 pp.124 – 150 of Book 1)

UNIT IV

12 Hours

Review of Basic Graph Theory - Modeling through Graphs , Directed Graphs , Signed Graphs and Weighted Digraphs and Unoriented Graphs – Modeling through Functional Equations .(Ch.7 pp.151-176, Ch.8 pp.177-183 of Book 1)

UNIT V

12 Hours

Introduction to Calculus of Variations – Euler’s Equations – Functionals dependent on First and Second Derivatives – Brachistochrone Problem – Isoperimetric Problems – Variational Methods of Solving Partial Differential Equations – Mathematical Modeling of Geometrical Problems and problems in Mechanics using Calculus of Variations. (Ch.9 pp.205 – 212 of Book)

Total No. of hours: 60.

TEXT BOOKS:

1. Kapur J.N (2003)*Mathematical Modeling*, New Age International Publishers.
2. Elsgolts I. (1971)*Differential Equations and Calculus of Variations*, Mir Pub.

REFERENCES:

1. Thomas, Saaty, Joyce, M.A, *Thinking With Models*, Pergamon Press.
2. Murthy, D.P.N , Page, N.W, Rudin, E.V (1990) *Mathematical Modeling*, Pergamon Press.
3. Mayer, W.J (1992), *Concepts of Mathematical Modeling*, McGraw Hill.



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal, Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17E02

FLUID DYNAMICS

4 0 0 4

Objectives

To give an in-depth knowledge of Fluid Dynamics and their applications.

To train the students to solve the problems in Fluid Dynamics.

UNIT I

12 Hours

Scalar and Vector Fields – Gradient and Direction Differentiator – Normal Flux - Divergence – Line Integrals – Relations between Surface and Volume Integrals – Relations between Line and Surface Integrals – Conservative Vector Fields – General Orthogonal Curvilinear Coordinates – Some Cartesian Tensor Notation . (pp.14-62 of the Text)

UNIT II

12 Hours

Real Fluids and Ideal Fluids – Velocity of a Fluid at a Point – Streamlines and pathlines-Velocity Potential – Vorticity Vector – Local and Particle Rates of Change – The Equation of Continuity – Acceleration – Conditions at a Rigid Boundary – General Analysis of Fluid Motion – Pressure at a Point in a Fluid at Rest and in a Moving Fluid – Euler's Equations of Motion – Bernoulli's Equation – The Case of Steady Motion Under Conservative Body Forces. (pp.70 – 110 of the Text)

UNIT III

12 Hours

Flows involving Axial Symmetry – Special Two Dimensional Flows – Impulsive Motion – Aspects of Vortex Motion – Sources, Sinks and Doublets – Images in a Rigid Infinite Plane – Images in Solid Spheres – Axi-Symmetric Flows – Stokes Stream Function – Stream Function for Axi-symmetric Irrotational Motions .(pp.110 – 159 of the Text)

UNIT IV

12 Hours

Two-Dimensional Flow – Use of Cylindrical Coordinates – The Stream Function – Complex Potential for Two-Dimensional Irrotational Incompressible Flow – Complex Velocity Potentials for Standard Two-Dimensional Flows – Two-Dimensional Image Systems – Milne-Thomson Circle Theorem – Theorem of Blasius – The Use of Conformal Transformations. (pp.160 – 201 of the Text)

UNIT V

12 Hours

Viscous Flow : Stress Components in a Real Fluid – Relations between Cartesian Components of Stress – Translational Motion of a Fluid Element – The Rate of Strain Quadric and Principal Stresses – Properties – Stress Analysis in Fluid Motion – Relations between Stress and Rate of Strain – Coefficient of Viscosity and Laminar Flow – The Navier-Stokes Equations of Motion – Problems - Steady Viscous Flow in Tubes of Uniform Circular Cross-Section – Diffusion of Vorticity – Energy Dissipation due to Viscosity–Steady Flow past a Fixed Sphere – Dimensional Analysis: Reynolds Number. (pp.310 – 345 of the Text)

Total No. of hours: 60

TEXT BOOKS:

1. Frank Chorlton (2003)*Textbook of Fluid Dynamics*, CBS Pub., New Delhi.

REFERENCES:

1. Batchelor, G.K. (2000)*An Introduction To Fluid Dynamics*, Camb.Univ.Press.
2. Chorin, A.J. Marsden, J.E (1993)*A Mathematical Introduction to Fluid Mechanics*, Springer.
3. Acheson, D.J. (1990)*Elementary Fluid Dynamics*, Clarendon Press, Oxford.



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17E03

PROBABILITY THEORY & STOCHASTIC PROCESSES

4 0 0 4

Objectives

To give an in-depth knowledge of Probability theory and Stochastic process and their applications.
To train the students to solve the problems in Probability Theory.

UNIT I

12 Hou

Probability Theory-Introduction- Sample space and events – Conditional probabilities – Independent Events – Baye’s formula – simple problems.(Sections 1.1- 1.6 of the Text)

UNIT II

12 Hours

Random variables- Discrete Random variables- Continuous random variables – Expectation of a random variable- Joint distributed random variables – Moments and Moment generating functions-Limit theorems –Conditional expectations - simple problems. (Sections 2.1 - 2.7., 3.4., 3.5 of the Text)

UNIT III

12 Hours

Stochastic Processes: Introduction – Classification of stochastic processes- Chapman-Kolmogrov equation – Limiting probabilities- Markov Decision processes- Poisson processes – Properties of Poisson processes- Generalizations of Poisson Processes - simple applications of Poisson processes.(Sections 2.8., 4.1- 4.4, 4.10, 5.3, 5.4 of the Text)

UNIT IV

12 Hours

Introduction to renewal theory- Limit theorems and its applications- Regenerative processes- Computing the renewal function. Reliability theory: Introduction –Reliability of systems of independent components- Expected life time – Systems with repair-simple applications (Sections 7.1., 7.3., 7.5., 7.8., 9.1., 9.3., 9.6., 9.7 of the Text)

UNIT V

12 Hours

Introduction to Brownian motion- Gambler’s ruin problem –Variations on Brownian motion - Pricing stock options- White Noise- Gaussian processes – Simple Applications (Sections 10.1., 10.3- 10.6 of the Text)

Total No. of hours: 60

TEXT BOOKS:

1. Ross (2003)*Introduction to Probability Models, 8th edition*,Elsevier..

REFERENCES:

1. Taylor, H.W. Karlin, S (1984) *An Introduction to Stochastic Modelling*,Academic press.
2. Ross, S.M (1996)*Stochastic processes,2nd Edition*, John Wiley.
3. Wentzel,W.Ovcharov, L. (1983)*Applied problems in probability theory*,Mir Publishers, Moscow.



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17E04

MODERN APPLIED ALGEBRA

4 0 0 4

Objectives

To give an in-depth knowledge of Applied Algebra and their applications.

To train the students to solve the problems in Rings, Fields and Coding theory.

UNIT I

12 Hours

Rings and Ideals: Introduction – Integral Domain and Field – Field of Quotients – Subrings – Morphisms of Rings – Direct Sums – Ideals and Quotient Rings – Divisibility – Euclidean Domains – Unique Factorization Theorem – Prime and Maximal Ideals . (pp.281 – 309 of Book 1)

UNIT II

12 Hours

Polynomial Rings and Polynomial Codes: The Ring $R[x]$ - Polynomial Rings over Fields – Polynomial Codes – Advantageous Properties - Shift Registers – Unique Factorization Theorem for Polynomials – Polynomial Functions and Formal Derivatives . (pp.315 – 339 of Book 1)

UNIT III

12 Hours

Fields – Quotient Field – Prime Field – Examples and Definitions – Simple Extensions – Finite Extensions - Finite Fields – Cyclotomic Polynomials – Factorization of Polynomials over finite fields- Berlekamp's Algorithm. (pp.124 – 175 of Book 2)

UNIT IV

12 Hours

Coding Theory: Introduction to Coding – Hamming distance – Hamming Bounds – Linear Codes – Generator Matrix – Decoding Algorithm – Hamming Code – Cyclic Codes – Special Cyclic Codes – BCH Code – Decoding BCH Codes. (pp. 183 – 236 of Book 2)

UNIT V

12 Hours

Cryptology: Classical Cryptosystems – Modular Enciphering – Caesar Cipher, Affine Cipher, Periodic Substitution Cipher – Hill Cipher – Examples – Public Key Cryptosystems - RSA Cryptosystem – Discrete Logarithms and Other Ciphers. (pp.239 – 279 of Book 2)

Total No. of hours: 60

TEXT BOOKS:

1. Garrett Birkhoff, Thomas, C. B (1987) *Modern Applied Algebra*, CBS Publishers, New Delhi.
2. Rudolf Lidl, Gunter Pilz (2004) *Applied Abstract Algebra, 2nd Edition*, Springer.

REFERENCES:

1. Berlekamp, E.R. (1968) *Algebraic Coding Theory*, McGraw Hill.
2. Peterson, W.W. (1961) *Error-Correcting Codes*, M.I.T Press.



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17E05

FUZZY SETS AND FUZZY LOGIC

4 0 0 4

Objectives

To give an in-depth knowledge of Fuzzy sets and Fuzzy Logic and their applications.

To train the students to solve the problems in Fuzzy Sets.

UNIT I

12 Hours

Fuzzy Sets: Introduction - Basic Concepts – α -cuts – Properties – Representations of Fuzzy Sets – Extension Principle .(pp.1 – 30, 35-48 of the Text)

UNIT II

12 Hours

Operations on Fuzzy Sets: Types – Fuzzy Complements – Fuzzy Intersections –Fuzzy Unions – Combinations of Operations – Aggregation Operations. (pp.50 – 94 of the Text)

UNIT III

12 Hours

Fuzzy Arithmetic: Fuzzy Numbers – Linguistic Variables – Arithmetic Operations on Intervals – Arithmetic Operations on Fuzzy Numbers - Lattice of Fuzzy Numbers – Fuzzy Equations . (pp.97 – 117 of the Text)

UNIT IV

12 Hours

Fuzzy Relations: Crisp versus Fuzzy Relations – Projections and Cylindric Extensions – Binary Fuzzy Relations – Binary Relations on a Single Set – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Ordering Relations – Fuzzy Morphisms. (pp. 119 – 144 of the Text)

UNIT V

12 Hours

Fuzzy Logic: An Overview of Classical Logic – Multi-valued Logics – Fuzzy Propositions – Fuzzy Quantifiers – Linguistic Hedges – Inference from Conditional Fuzzy Propositions - Inference from Conditional and Qualified Propositions – Inference From Quantified Propositions . (pp. 212 – 242 of the Text)

Total No. of hours: 60

TEXT BOOKS:

1. George Klir, Bo Yuan (2000)*Fuzzy Sets and Fuzzy Logic – Theory & Applications*, Prentice Hall India.

REFERENCES:

1. Zimmermann, H.J. (1985)*Fuzzy set Theory and Its Applications*, Kluwer.



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17E06

Statistical Quality Control

4 0 0 4

Objectives

To give an in-depth knowledge of Statistical Quality Control and their applications.

To train the students to solve the problems in Statistical Quality Control.

UNIT I

12 Hours

Quality Assurance in Business and Industries – Meaning of Quality – Quality Assurance – Quality Cost – Methods of Quality Assurance – Responsibility for Quality – Statistical Process Control – Chance and Assignable Causes of Quality Variation - Statistical Basis of Control Charts. (Ch..1.1 – 1.5, Ch.4.1 – 4.2 of the Text)

UNIT II

12 Hours

Control Charts for Attributes: Control Chart for Fraction Non-conforming – p, np Charts - Variable Sample Size – O.C.Functions – Control Charts for Non-conformities (Defects) – C Chart – Procedures with Constant Sample Size – O.C.Functions. (Ch.5.1 – 5.3.1 & 5.3.4 of the Text)

UNIT III

12 Hours

Control Charts for Variables: Introduction – Control Charts for X and R – Development and Use of X and R Charts – Control Limits – Specification limits and Natural Tolerance Limits – Probability Limits on the X and R Charts – Interpretation O.C.Functions. (Ch.6.1 – 6.2.2 upto pp.183, pp.187-192 & Ch.6.2.6 of the Text)

UNIT IV

12 Hours

Acceptance Sampling : Lot-by Lot Acceptance Sampling for Attributes – Acceptance Sampling Problem – Advantages and Disadvantages – Single Sampling Plan for Attributes – OC Curve – Effects of n and c on OC Curve – Type A and Type B – OC Curves – Designing SSP with a specified OC Curve - AOQ & ATI. (Ch.10.1 – 10.1.1, Ch.10.2 of the Text)

UNIT V

12 Hours

Acceptance Sampling by Variables: Types of Sampling Plans Available – Caution and use of Variables Sampling – Designing a Variables Sampling Plan with a Specified OC Curve – MIL-STD-105D and MIL-STD-414 - Dodge-Romig Sampling Plans & Uses.(Ch. 11.1 – 11.2, 10.5.1-10.5.2, 10.6, 11.3.1-11.3.2 of the Text)

Total No. of hours: 60

TEXT BOOKS:

1. Douglas Montgomery (2009)*Introduction to Statistical Quality Control*, John Wiley & Sons.



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17E07

GRAPH THEORY

4 0 0 4

Objectives

To study the applications of Graph Theory in other disciplines.

UNIT I

12 Hours

Graphs - Graph Isomorphism - The Incidence and Adjacency Matrices – Subgraphs - Vertex Degrees - Paths and Connection - Cycles - Trees - Cut Edges and Bonds - Cut Vertices.
(Chapter 1 Section 1.1 - 1.7; Chapter 2 Section 2.1 - 2.3)

UNIT II

12 Hours

Connectivity - Blocks - Euler tours - Hamilton Cycles. (Chapter 3 Section 3.1 - 3.2; Chapter 4 Section 4.1 - 4.2)

UNIT III

12 Hours

Matchings - Matchings and Coverings in Bipartite Graphs - Edge Chromatic Number - Vizing's Theorem.
(Chapter 5 Section 5.1 - 5.2; Chapter 6 Section 6.1 - 6.2)

UNIT IV

12 Hours

Independent sets - Ramsey's Theorem - Chromatic Number - Brooks' Theorem - Chromatic Polynomials.
(Chapter 7 Section 7.1 – 7.2; Chapter 8 Section 8.1 – 8.2, 8.4)

UNIT V

12 Hours

Plane and planar Graphs - Dual graphs - Euler's Formula - The Five-Colour Theorem and the Four-Colour Conjecture.
(Chapter 9 Section 9.1 - 9.3, 9.6)

Total No. of hours: 60

TEXT BOOKS:

1. Bondy, J.A. Murthy, U.S.R (1976) *Graph Theory and Applications*, Macmillan, London.

REFERENCES:

1. J. Clark, J. Holton, D.A (1995) *A First look at Graph Theory*, Allied Publishers, New Delhi.
2. Gould, R (1989) *Graph Theory*, Benjamin/Cummings, Menlo Park.
3. Gibbons, A (1989) *Algorithmic Graph Theory*, Cambridge University Press, Cambridge.
4. Wilson, R.J. Watkins, J.J (1989) *Graphs: An Introductory Approach*, John Wiley and Sons, New York.
5. Wilson, R.J (2004) *Introduction to Graph Theory*, Pearson Education, 4th Edition.
6. Choudum, S.A (1987) *A First Course in Graph Theory*, MacMillan India Ltd..



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



DEPARTMENT OF MATHEMATICS

HMMA17E08

DISCRETE MATHEMATICS

4 0 0 4

Objectives

To give an in-depth knowledge of Discrete Mathematics and their applications.

To train the students to solve the problems in Discrete Mathematics.

To introduce the different notions grammar.

UNIT I

12 Hours

Statements – Connectives – Tautologies – Equivalence – Duality – Tautological Implications- Normal forms – Theory of Inference for the statement calculus – Predicate calculus – Inference theory of the predicate calculus.

UNIT II

12 Hours

Basic Concepts – Operations on Sets – Relations and Ordering – Equivalence relations – Partial ordering – Functions – Composition of functions – Inverse functions.

UNIT III

12 Hours

Semi-groups and Monoids – Groups – Subgroups – Homomorphisms – Cosets – Lagrange's theorem – Normal subgroups – Algebraic Systems with two binary Operations.

UNIT IV

12 Hours

Lattices as partially ordered sets – Properties of Lattices – Sublattices – Direct Product – Homomorphism in lattices. Boolean Algebra – Sub algebra – Direct product and Homomorphism in Boolean Algebra

UNIT V

12 Hours

Graph theory: Basic Concepts – Digraphs – Isomorphism – Paths – Reachability and Connectedness – Trees – Matrix Representations of Graphs.

Total No. of hours: 60

TEXT BOOKS:

1. Tremblay, J.P, Manohar, R (1975) *Discrete Mathematical Structures with Applications to Computer Science*, McGraw Hill.

REFERENCES:

1. Kolman, Busby, Ross *Discrete Mathematical Structures*, Pearson Education Series.

2. Liu, J. *Elements of Discrete Mathematics*, McGraw Hill.