BHARATHIAR UNIVERSITY, COIMBATORE
Br. I. (b). M Sc Mathematics (CA)
(The Curriculum is offered by the University Department under CBCS Pattern)
(with effect from 2011 Batch onwards)

Eligibility for Admission to the Course

A candidate who has passed the Degree Examination **in B.Sc. (Mathematics) or B.Sc. (Mathematics with Computer Applications)** of this University or an examination of some other University accepted by the Syndicate as equivalent thereto shall be eligible for admission to the **Master Degree in Mathematics (CA)** of this University.

SCHEME OF EXAMINATIONS

Sem.	Subject Code	Title of the Paper	Class Hrs.	University Exam			Credit
				CIA	Ext.	Total Marks	
I	MATBC1	Algebra	5	25	75	100	4
	MATBC2	Analysis	5	25	75	100	4
	MATBC3	Differential Equations	5	25	75	100	4
	MATBC4	Numerical Methods	5	25	75	100	4
	MATBE1	Programming Languages	5	25	75	100	4
	Supportive - I		2	25	75	50	2
II	MATBC5	Discrete Mathematics	5	25	75	100	4
	MATBC6	Fluid Dynamics	5	25	75	100	4
	MATBC7	*MatLab (Theory and Practical)	3T+ 4P	25	75	100*	4
	MATBC8	Computational Mathematics (Practical Only)	5	25	75	100	4
	MATBE2	*Java Programming (Theory and Practical)	3T+ 4P	25	75	100*	4
	Supportive - II		2	25	75	50	2
III	MATBC9	Operations Research	5	25	75	100	4
	MATBC10	Data Structures	5	25	75	100	4
	MATBC11	Data Structures (Lab)	5	40	60	100	4
	MATBC12	Topology	5	25	75	100	4
	MATBE3	*Mathematica (Theory and Practical)	3T+ 4P	25	75	100*	4
	Supportive-III		2	25	75	50	2
IV	MATBC13	Mathematical Methods	5	25	75	100	4
	MATBC14	*Oracle (Theory and Practical)	3T+ 4P	25	75	100*	4
	MATBE4	Data warehousing (or) Fundamentals of Actuarial Mathematics	5	25	75	100	4
	MATBP	Project Work	---	---	---	300**	12

Total Marks: 2250 **Credits: 90**

*** Papers have Theory and Practical Examinations**
Theory – 60 marks; Practical – 40 marks
**** Project Report – 240 marks; Viva Voce – 60 marks**

Supportive Courses for other Department Students
1. Numerical Methods (Odd Semester)
2. Differential Equations (Even Semester)

MATBC1: ALGEBRA

UNIT I
Group Theory:
Permutation Groups – Another counting principle – Sylow's theorem

UNIT II
Ring Theory:
Euclidean rings – A particular Euclidean ring – Polynomial rings – Polynomials over the rational field.

UNIT III
Fields:
Extension Fields – Roots of polynomials – More about roots.

UNIT IV
Fields:
Elements of Galois theory – Finite Fields.

UNIT V
Linear Transformations:
Canonical forms: Triangular form – Trace and Transpose – Hermitian, unitary and normal Transformations.

Text Book:

Topics in Algebra by I.N.Herstein (II Edition)

Unit I : Chapter 2 - Sections 2.10 to 2.12.
Unit II : Chapter 3 - Sections 3.7 to 3.10.
Unit III : Chapter 5 - Sections 5.1,5.3 and 5.5.
Unit IV : Chapter 5 - Section 5.6.
Chapter 7 - Section 7.1.
Unit V : Chapter 6 - Sections: 6.4,6.8 and 6.10.

Reference Books :

1. J.B.Fraleigh, A First Course in Abstract Algebra, Narosa Publishing House, New Delhi, 1988.

2. M.Artin, Algebra, Prentice-Hall, Englewood Cliff, 1991.

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

MATBC2: ANALYSIS

RIEMANN STILTJES INTEGRAL:

UNIT I

Definition and Existence of the Integral – properties of the integral – Integration and differentiation – Integration of vector valued function – rectifiable curves.

UNIT II

Uniform convergence and continuity– uniform convergence and integration – uniform convergence and differentiation – equicontinuous families of functions – The Stone Weirstrass theorem.

FUNCTIONS OF SEVERAL VARIABLES

UNIT III

Linear transformation – contraction principle – Inverse function theorem – Implicit function theorem – determinants – derivatives of higher order – differentiation of integrals.

MEASURE THEORY AND INTEGRATION

UNIT IV :

Introduction - Lebesgue outer measure - measurable sets - Borel sets - regular measure - Lebesgue measurable function – Borel measurable function.

UNIT V :

Integration of non –negative functions - Lebesgue integral- Fatou's lemma- Lebesgue monotone convergence theorem - Lebesgue Dominated convergence theorem – Riemann and Lebesgue integrals.

Text Books:

1.For **Unit-I to III** relevant chapters from: Principles of Mathematical Analysis by W. Rudin, McGraw Hill, New York, 1976

2.For **Unit-IV and V** relevant chapters from: Measure theory and Integration by G.de Barra, E.Horwood Publishing Company ,1981

Reference Books :

1. Real Analysis by H. L. Roydon, Third Edition, Macmillan Company, New York, 1988.

MATBC3: DIFFERENTIAL EQUATIONS

UNIT I

Linear Equations with constant coefficients– Second order Homogeneous equations – Initial value problems – Linear dependence and independence - Wronskian and a formula for Wronskian – Non Homogeneous equation of order two.

UNIT II

Homogeneous and Non-Homogeneous Equations of order n – Initial value problems – Annihilator Method to solve a Non-Homogeneous Equation – Algebra of constant coefficients operators.

UNIT III

Linear Equations with variable coefficients - Initial value problems – Existence and Uniqueness Theorems – Solutions to a Non-Homogeneous Equation – Wronskian and Linear dependence – reduction of the order of a homogeneous equation - Homogeneous equation with analytic coefficients – The Legendre equation.

UNIT IV

Nonlinear Partial Differential Equations of the first order – Cauchy's method of characteristics – Compatible systems of first order equations – Charpit's method- Special types of First order equations – Jacobi's method.

UNIT V

Partial Differential Equations of Second order – The origin of Second-order Equations – Linear Partial Differential Equations with constant coefficients – Equations with variable coefficients – Characteristics curves of second-order equations – Characteristics of equations in three variables, Separation of variables.

Text Books:

1.For **Unit I-III:** An Introduction to Ordinary Differential Equations by E. A.Coddington, Prentice Hall of India Ltd.

2.For **Unit IV-V:** Elements of Partial Differential Equations by IAN N. SNEDDON, McGraw- Hill Book Company

MATBC4: NUMERICAL METHODS

UNIT I

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

UNIT II

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

UNIT III

Solution of Ordinary Differential Equations: Taylor series method – Euler and Modified Euler methods – Rungekutta methods (Second and Fourth order)– Multistep methods – Milne's method – Adams Moulton method.

UNIT IV

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

UNIT V

Numerical Solution of Partial Differential Equations: (Solutions of Elliptic, Parabolic and Hyperbolic partial differential equations) Representation as a difference equation – Laplace's equation on a rectangular region – Iterative methods for Laplace equation – The Poisson equation – Derivative boundary conditions – Solving the equation for time-dependent heat flow (i) The Explicit method (ii) The Crank Nicolson method – solving the wave equation by Finite Differences.

Text Book:

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

Reference Books:

1. S.C. Chapra and P.C. Raymond: Numerical Methods for Engineers, Tata McGraw Hill, New Delhi, (2000)
2.R.L.Burden and J.Douglas Faires: Numerical Analysis, P.W.S.Kent Publishing Company, Boston (1989), Fourth Edition.
3. S.S. Sastry: Introductory methods of Numerical Analysis, Prentice Hall of India, New Delhi, (1998).
4. P. Kandasamy etal: Numerical Methods, S. Chand & Company Ltd., New Delhi (2003).

MATBE1: PROGRAMMING LANGUAGES

UNIT I

Principles of Object-Oriented Programming: Software crisis – Software evolution – A look at procedure-oriented Programming – Object-oriented Programming Paradigm – Basic Concept of Object-Oriented Programming – Inheritance – Polymorphism - Benefits of OOP –Object-Oriented languages – Applications of OOP.

UNIT II

Tokens, Expressions and Control structure: Introduction –Tokens – Keywords– Identifiers and constants – basic data types – User defined data types- Derived data types – Symbolic constants –Type compactability – Declaration of variables – Dynamic insulation of variables– Reference variables –operations in C++- Scope resolution operator– member Dereferencing operators – memory management operators – Manipulators – type cast operator – expressions and their types – Special assignment expressions – implicit conversions – operator over loading – operator precedence – Control structures.

UNIT III

Functions in C++: Introduction – The main function – Function prototyping– call by reference – return by reference inline functions – default arguments – constant arguments – function over loading – friend and virtual functions – Math library functions. Managing Console I/O operations: Introduction – C++ streams – C++ stream classes – Unformatted I/O operations - Formatted I/O operations – Managing output with manipulators.

UNIT IV

Classes and Objects: Introduction – C Structures Revisited – Specifying a class – Defining Member Functions – A C++ Program with class – Making an outside Function Inline –Nesting o f Member Functions – Private Member Functions – Arrays within a class – Memory Allocation for Objects – Static Data Members – Static Member Functions – Arrays of Objects – Objects as Function Arguments – Friendly functions – Returning Objects – Constant Member Functions. Constructors and Destructors: Introduction – Constructors – Parameterized Constructors – Multiple Constructors in a class – Constructors with Default Arguments –Dynamic Initializations of Objects – Copy Constructor – Constructing Two dimensional arrays – Constant Objects – Destructors.

UNIT V

Operators Overloading and Type Conversions: Introduction – Defining Operator Overloading – Overloading Unary Operators – Overloading Binary Operators – Overloading Binary Operators Using Friends – manipulating of strings Using Operators – Rules of Overloading Operators.

Inheritance: Extending Classes : Introduction – Defining Derived Classes – Single inheritance – Making a Private Member Inheritable– Multilevel Inheritance – Multiple Inheritance – Hierarchical Inheritance – Hybrid Inheritance – Virtual Functions – Virtual Base Classes – Abstract Classes – Constructors in Derived Classes – Member Classes: Nesting of Classes.

Text Book:

Object – Oriented Programming with C++ by E. Balaguruswamy, Tata McGraw-Hill Publishing Company limited, 1999.

Unit I : 1.1 – 1.8
Unit II : 3.1 – 3.24
Unit III : 4.1 – 4.11 and 10.1 – 10.6
Unit IV : 5.1 – 5.17, 6.1 – 6.7 and 6.9 – 6.11
Unit V : 7.1 – 7.7 and 8.1 – 8.12

MATBC5: DISCRETE MATHEMATICS

UNIT I: Logic

Propositions – Logical Connectives - Compound statements – Conditional and Biconditional Propositions – Truth tables – Tautologies and Contradictions – Logical equivalence and implications – Demorgan's Law – Normal forms – PDNF and PCNF – Predicate Calculus – Free and bound variables – Quantifiers – Universe of discourse – Theory of inference– Rules of universal specification and generalization – Arguments – Validity of Arguments.

UNIT II: Set Theory

Basic concepts – Notations –Algebra of sets – The power sets – Ordered pairs and Cartesian products–Relation and its types – Properties –Relational Matrix and the graph of relation – Partitions–Equivalence relations – Poset-Hasse diagram – Lattices and their properties – Sublattice – Boolean Algebra – Homomorphism.

UNIT III: Functions

Definitions of functions and its Classification – Types –Examples – Composition of functions – Inverse functions – Binary and n-ary operations – Characteristic function of a set – Hashing functions – Recursive functions – Permutation functions.

UNIT IV: Graph Theory

Graph Theory: Introduction – Basic terminology – Representation of graphs – connectivity – Eulerian and Hamiltonian graphs – Planar graphs- Directed graphs- Application of Graphs. Trees: Binary tree – traversals of a binary tree – Expansion trees.

UNIT V: Grammars and Languages

Definitions – Types of Grammars – Productions – Regular Grammar and Languages– Finite state Automata (FSA) – Deterministic and Non-Deterministic FSA – Conversion of NDFSA to DFSA.

Text Book:

Trembley J.P and Manohar.R, "Discrete Mathematical Structures With applications to Computer Science", Tata Mc Graw- Hill Pub.Co. Ltd, New Delhi, 2003.

(Contd.)

Reference Books:

1. Ralph.P.Grimmaldi, "Discrete and Combinatorial Mathematics - An Introduction", Fourth edition, Perarson Education, Asia, Delhi, 2002..
2. Hopgaff and Ullman, Introduction to Automata Theory, "Languages and Computation", Pearson Edition, Asia, Delhi.
3. Doerr Alar and Levasseur Kenneth, 'Applied discrete structures for Computer Science', Gal Gotia publications Pvt. Ltd. (2002).

MATBC6: FLUID DYNAMICS

UNIT I

Introductory Notions – Velocity- Stream Lines and Path Lines- Stream Tubes and Filaments- Fluid Body- Density- Pressure - Differentiation following the Fluid- Equation of continuity- Boundary conditions- Kinematical and physical- Rate of change of linear momentum- Equation of motion of an inviscid fluid.

UNIT II

Euler's momentum Theorem - Conservative forces - Bernoulli's theorem in steady motion - energy equation for inviscid fluid- circulation - Kelvin's theorem - vortex motion - Helmholtz equation.

UNIT III

Two Dimensional Motion- Two Dimensional Functions- Complex Potential Basic singularities - Source - Sink- Vortex - Doublet - Circle theorem - Flow past a Circular cylinder with circulation - Blasius Theorem- Lift force (Magnus effect).

UNIT IV

Viscous flows – Navier-Stokes equations- some exact solutions of Navier Stokes equations- Flow between parallel flat plates- Couette flow- Plane Poiseuille flow- Steady flow in pipes: Flow through a pipe- The Hagen Poiseuille flow.

UNIT V

Laminar Boundary Layer in incompressible flow: Boundary Layer concept- Boundary Layer equations- Boundary Layer along a flat plate- The Blasius solution- Shearing stress and boundary layer thickness- Displacement thickness, momentum thickness- Momentum integral theorem for the boundary layer- The Von Karman Integral relation - The Von Karman Integral relation by momentum law.

Text Books:

1. For **Units I and II:** 'Theoretical Hydrodynamics' by L.M.Milne Thomson, Macmillan Company, V Edition (1968).
2. For **Unit III:** 'Modern Fluid Dynamics' Vol-I by N.Curle and H.J.Davies,DVan Nostrand Company Ltd., London (1968).
3. For **Units IV and V:** 'Foundations of Fluid Mechanics' by S.W.Yuan, Prentice -Hall (1976).

MATBC7: MATLAB
(Theory-60 marks and Practical-40 marks)

UNIT I

Introduction - Basics of MATLAB, Input – Output, File types – Platform dependence – General commands.

UNIT II

Interactive Computation: Matrices and Vectors – Matrix and Array operations – Creating and Using Inline functions – Using Built-in Functions and On-line Help – Saving and loading data – Plotting simple graphs.

UNIT III

Programming in MATLAB: Scripts and Functions – Script files – Functions files-Language specific features – Advanced Data objects.

UNIT IV

Applications – Linear Algebra - Solving a linear system – Finding Eigen values and Eigen vectors – Matrix Factorizations.

UNIT V

Applications – Data Analysis and Statistics – Numerical Integration – ordinary differential equations – Nonlinear Algebraic Equations.

Text Book:

RUDRA PRATAP, Getting Started with MATLAB-A Quick Introduction for Scientists and Engineers, Oxford University Press, 2003.

Reference Books:

1. William John Palm, Introduction to Matlab 7 for Engineers, McGraw-Hill Professional, 2005.
2. Dolores M. Etter, David C. Kuncicky, Introduction to MATLAB 7, Prentice Hall, 2004

MATLAB (PRACTICAL)
LAB LIST

1.Plotting a function.
2.Polar plot.
3.Addition of two matrices.
4.Finding the determinant of a matrix.
5.Finding Eigen values and Eigen vectors of a matrix.
6.Straight line fit.
7.Exponential curve fitting.
8.Solving a first-order linear ODE.
9.Solving a second-order nonlinear ODE.
10.Solving nonlinear algebra equations.

MATBC8: COMPUTATIONAL MATHEMATICS (PRACTICAL ONLY)
Implementing the Algorithm studied in MATBE1

LAB LIST

1. Transpose of a Matrix
2. Matrix Multiplication
3. Obtaining Eigen value and Eigen vector of a matrix
4. Solving a Transcendental equation using Newton Raphson Method
5. Matrix Inversion by Gauss Jordan Method
6. Solving a set of Simultaneous Equations by Gauss Elimination Method
7. Solving a set of Simultaneous Equations by Gauss Jacobi Method
8. Solving a set of Simultaneous Equations by Gauss Seidel Method
9. Integration using Trapezoidal Rule
10. Integration using Simpson's $1/3^{rd}$ Rule
11. Solving First order ODE using Second order Runge-Kutta Method
12. Solving First order ODE using Fourth order Runge-Kutta Method
13. Solving First order ODE using Euler's Method
14. Solving First order ODE using Modified Euler's Method
15. Solving the First order ODE using Milne's Predictor Corrector Method

MATBE2: JAVA PROGRAMMING
(Theory 60 and Practical 40)

UNIT I

Basic concepts of object oriented programming – benefits & applications of OOP. JAVA evolution: Java features – Java and C – Java and C++ - Java and Internet. Overview of JAVA language: Introduction - implementation of java program – creating, compiling, running the program, JVM.

UNIT II

Data Types– operators and Expressions – Strings, Arrays– Branching: Decision making with if statement, if…else statement, nesting if…else statements, the else if ladder, switch statement. Looping: The while statement, do statement, for statement- additional features of for loop: nesting of for loops; jumps in loops – jumping out of a loop; skipping a part of loop; labeled loops

UNIT III

Classes and Objects: Introduction; adding variables, creating and adding methods, constructors, overloading; Inheritance – defining a subclass, multilevel inheritance, hierarchical inheritance, overriding methods, visibility control, rules of thumb.

UNIT IV

Packages– Multithreaded Programming: creating threads, extending the thread class- implementing the run() method, starting new thread stopping and blocking a thread- life cycle of a thread – new born state, running state, blocked state, dead state.

UNIT V

Applet: Basics – Architecture – Passing parameters to Applets – Skeleton – simple Applet – AWT.

Books for Study:

1. The JAVA Programming Language b y Ken Arnold, James Gosslings.
2. The Complete Guide to JAVA Database Programming by Matthew siple, TMH
3. Programming with JAVA a Primer – E.Balagurusamy,TMH
4. JAVA For you by Koparkar,TMH
5. The Complete Reference - Java 2.0, Herbert Schildt, Fourth Edition, TATA McGraw Hill.

JAVA PROGRAMMING (PRACTICAL)

LAB LIST

1. Mathematical Operations
2. Matrix Manipulation
3. Student Mark list using Multilevel Inheritance
4. Employee details using Multiple Inheritance
5. Packages
6. Constructors
7. Thread
8. Thread using runnable interface
9. Applet
10. Displaying different shapes using Applets

MATBC9: OPERATIONS RESEARCH

UNIT I

Introduction to L.P. – Graphical L.P. Solution – Sensitivity analysis – Simplex Method –L.P. solution space in equation form – Transition from graphical to algebra solution – The simplex method – artificial starting solution – Special cases in simplex method applications. Duality – Primal and Dual – relationships – additional simplex algorithm for L.P.

UNIT II

Advanced Linear Programming – Generalized simplex Tableau in matrix form –Decomposition algorithm – Matrix definition of dual problem – optimal dual solution.

UNIT III

Integer L.P. and Dynamic Programming – Integer Programming – Integer Programming algorithm – Gomory cutting plane algorithm – Branch and Bound algorithm - Solution of the Traveling salesperson problem – Deterministic Dynamic programming – Recursive nature of computation in D.P. – Forward and Backward recursion.

UNIT IV

Classical optimization Theory – unconstraint problems – Necessary and sufficient conditions – The Newton-Raphson method – constrained problems – Equality constraints (Jacobi method and Lagrangian method).

UNIT V

Non-linear programming – unconstrained algorithms - Direct search method – Gradient method – constraint algorithms – Separable programming – Quadratic programming.

Text Book:

Hamdy A Taha, Operations Research (Seventh Edition) – Prentice Hall of India Private Limited, New Delhi (2004).

Unit-I : Chapter 2: 2.2, 2.3, omit 2.2.3 and 2.3.3.Chapter 3: 3.1 – 3.5, omit 3.3.3.
Chapter 4: 4.2 and 4.4
Unit-II : Chapter 7: 7.1.2, 7.4 and 7.5
Unit-III: Chapter 9: 9.2 and 9.3, omit 9.2.2 and 9.2.4.Chapter 10: 10.1 and 10.2
Unit-IV: Chapter 20: 20.1, 20.12, 20.2.1.
Unit-V : Chapter 21: 21.1, 21.2.1, 21.2.2.

MATBC10: DATA STRUCTURES

UNIT I: INTRODUCTION & ARRAYS

Introduction: Overview - SPAR KS - How to Create Programs - How to Analyze Programs. Arrays: Axiomatization - Ordered Lists - Sparse Matrices - Representation of Arrays.

UNIT II: STACKS, QUEUES & LINKED LISTS

Stacks and Queues: Fundamentals - A Mazing Problem - Evaluation of Expressions - Multiple Stacks and Queues. Linked Lists : Singly Linked Lists - Linked Stacks and Queues - Polynomial Addition - Doubly Linked Lists and Dynamic Storage Management.

UNIT III: TREES

Basic Terminology - Binary Trees - Binary Tree Representations - Binary Tree Traversal- More on Binary Trees - Threaded Binary Trees - Representation of Binary Trees - Applications of Trees - Counting Binary Trees.

UNIT IV: SORTING

Internal Sorting : Searching - Insertion sort - Quick sort - 2-way Merge sort - Heap sort.External Sorting : Storage Devices - Sorting with Disks.

UNIT V: GRAPHS & FILES

Graphs : Terminology and Representations - Traversals, Connected Components and Spanning Trees - Shortest paths and Transitive Closure - Activity Networks, Topological Sort and Critical Paths. Files : Files, Queries and Sequential Organizations - Hashed Indexes - File Organizations: Sequential Organizations - Random organizations.

Text Book:

Ellis Horowitz, Sartaj Sahni, 'Fundamentals of Data Structures' , Galgotia Book Source P.Ltd., New Delhi,, 2003.

Reference Books:

1. Kruse R.L., Leung BP.Tondo C.L, Data structures and pro gram design in C, PHI,1995.
2. Tanenbaum A.S, Lan gram Y., Augestein M.J., Data structures using C, PHI, 1992.
3. Jean Paul Tremblay, Paul G.Sorenson, An Introduction to data structures with Application, Tata McGraw Hill,1995.

MATBC11: DATA STRUCTURES (LAB)

LAB LIST

1. Transpose of a Matrix
2. Sparse Matrix using array
3. Stack using array
4. Queue using array
5. Evaluation of infix to postfix expressions
6. Singly Linked Operations
7. Linear Search
8. Binary Search
9. Factorial of a given number
10. Insertion Sort
11. Quick Sort
12. Merge Sort
13. Selection Sort
14. Heap Sort
15. File Operations.

MATBC12: TOPOLOGY

UNIT I

Topological Spaces – Basis for a Topology – The Order Topology– The product Topology on X x Y- The Subspace Topology- Closed Sets and Limit Points.

UNIT II

Continuous Functions – The Product Topology – The Metric Topology – The Metric Topology (continued).

UNIT III

Connectedness and Compactness: Connected Spaces – Connected sets in R- Components and Path Components – Local Connectedness – Compact Spaces – Limit Point Compactness– Local Compactness.

UNIT IV

Countability and Separation Axioms: Countability Axioms – Separation Axioms - Urysohn's Lemma – Urysohn Metrization Theorem.

The Tychonoff Theorem: The Tychonoff Theorem – Completely Regular spaces – The Stone-Cech Compactification.

UNIT V

Complete Metric Spaces - Compactness in Metric Spaces- A space-Filling Curve – Pointwise and Compact Convergence –The Compact-Open Topology- Ascoli's Theorem.

Text Book:

Topology A First Course by James R.Munkres, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.

UNIT I Relevant sections in Chapter- 2
UNIT II Relevant sections in Chapter- 2
UNIT III Relevant sections in Chapter- 3
UNIT IV Relevant sections in Chapters- 4 and 5
UNIT V Relevant sections in Chapter- 7

Reference Books:

1. J.Dugundji, Topology, Allyn and Bacon, 1966(Reprinted in India by Prentice Hall of India Pvt. Ltd.).
2. George F. Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill Book Company,1963.
3. J.L.Kelley, General Topology, Van Nostrand, Reinhold Co.,New York,1995.
4. L.Steen and J.Seebach, Counter examples in Topology, Holt,Rinehart and Winston, New York,1970.
5. R.Engelking,General Topology, Polish Scientific Publishers,Warszawa,1977.
6. Sze – Tsen Hu, Elements of General Topology, Holden – Day,Inc.1965.

MATBE3: MATHEMATICA
(Theory-60 marks and Practical-40 marks)

UNIT I

Running mathematica– Numerical calculations – Building Up calculations – Using the Mathematica system.

UNIT II

Algebraic calculations – systematic computation– values of symbols – transforming Algebraic expressions – simplifying Algebraic expressions – putting expression into different forms – simplifying with assumption – symbolic mathematics– sums and products – relation and logical operators – solving equations – Inequalities – differential equations – power series – limits – Integral transforms – recurrence equations – mathematical notation and note books.

UNIT III

Numerical Mathematics: Basic operations – Numerical sums, product and integrals -Numerical equation solving – Numerical differential equations – Numerical optimization –Manipulating numerical data – Statistics.

Functions and Programs: Defining functions – functions as procedures – Repetitive operations – Transformation rules for functions – Lists – Collecting objects together – Making tables of values – Vectors and matrices – Getting pieces of lists – Testing and searching list elements – adding, removing and modifying list elements – combining lists – rearranging lists – ordering in lists.

UNIT IV

Graphics: Basic plotting – options – Redrawing and combining plots– manipulating options – Three-dimensional surface plots – converting between types of Graphics.

UNIT V

Input and output in Notebooks: Entering Greek letters – Two dimensional inputs – editing and evaluating two – dimensional expressions – entering formulas – entering tables and matrices – subscripts, bars and other modifiers – Non-English characters and key boards – other mathematical Notation – Forms of input and output – mixing text and formulation - displaying and printing mathematica notebooks.

Text Book:

Stephen Wolfram, The Mathematica Book , Fifth Edition, Wolfram Media Inc., 2003. (contd.)

MATHEMATICA (PRACTICAL)

LAB LIST

1. Numerical Calculations
2. Mathematical Functions
3. Algebraic Calculations
4. Symbolic Mathematics
5. Symbolic Mathematics – Solving Equations
6. Numerical Mathematics
7. Functions
8. Lists
9. Graphics-Two Dimensional Plots
10. Graphics – Three Dimensional Plots
11. Input and Output in Notebooks
12. Input and Output forms.

MATBC13: MATHEMATICAL METHODS

UNIT I

FOURIER TRANSFORMS: Fourier Transforms – Defn Inversion theorem – Fourier cosine transforms - Fourier sine transforms – Fourier transforms of derivatives - Fourier transforms of some simple functions - Fourier transforms of rational functions – The convolution integral – convolution theorem – Parseval's relation for Fourier transforms – solution of PDE by Fourier transform - Laplace's Equation in Half plane - Laplace's Equation in an infinite strip - The Linear diffusion equation on a semi-infinite line - The two-dimensional diffusion equation.

UNIT II

HANKEL TRANSFORMS: Definition – Elementary properties of Hankel Transforms -Hankel Transforms of Derivatives of functions - Hankel Transforms of some elementary functions - The Parseval relation for Hankel transforms – Relation between Fourier and Hankel transforms – Application to PDE - Axisymmetric Dirichlet problem for a half space - Axisymmetric Dirichlet problem for a thick plate

UNIT III

INTEGRAL EQUATIONS: Types of Integral equations–Equation with separable kernel- Fredholm Alternative Approximate method – Volterra integral equations–Classical Fredholm theory – Fredholm's First, Second, Third theorems.

UNIT IV

Application of Integral equation to ordinary differential equation – initial value problems – Boundary value problems – singular integral equations – Abel Integral equation

UNIT V

CALCULUS OF VARIATIONS: Variation and its properties – Euler's equation – Functionals of the integral forms - Functional dependent on higher order derivatives – functionals dependent on the functions of several independent variables – variational problems in parametric form.

Text Books:

1.For Unit I and II: The Use of Integral Transforms by I.N.Sneddon, Tata Mc Graw Hill, New Delhi, 1974.
2.For Unit III and IV: Linear Integral Equations Theory and Technique by R.P.Kanwal, Academic Press, New York, 1971.
3.For Unit V: Differential Equations and Calculus of Variations – by L.Elsgolts, Mir Publishers, Moscow, 1970.

MATBC14: ORACLE
(Theory – 60marks and Practical- 40 marks)

UNIT I

ORACLE 8.0 – Data types – Basic parts of SQL, DDL, DML, and TCL.

UNIT II

String functions – Group value functions – Single value functions – Data functions and views.

UNIT III

Indexes – Sequences – Sub queries – Reports in SQL PLUS.

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UNIT IV

Introduction to PL/SQL – PL/SQL Block – Exception handling.

UNIT V

Triggers – Procedures – Cursors.

Book For Study:

ORACLE 8 The Complete Reference, George Koch Kevin Loney, TATA McGraw Hill.

ORACLE (PRACTICAL)
LAB LIST

1**.** DML Commands
2.Group Functions
3. String Functions
4. Date Functions
5. Queries for using Simple Conditions
6. Conditional Control
7. Cursors
8. Explicit Cursors
9. Exception Handling
10.PL / SQL Trigger to Check a Condition

MATBE4: DATA WAREHOUSING

UNIT I

Introduction – Delivery process – System processes – Process architecture.

UNIT II

Database Schema – Partitioning strategy – Aggregations – Data Marting – OLAP in Data Warehousing.

UNIT III

Metadata – System and Data warehouse process managers - Hardware architecture – Physical layout.

UNIT IV

Security – Backup recovery – Service level agreement – Operating the data warehouse – Data Warehousing Vs Data mining.

UNIT V

Capacity planning – Tuning the Data warehouse – Testing the Data warehouse – Data warehouse futures.

Book for Study :

1."Data warehousing in the real world", Sam Anahory, Dennis murray, Pearson education, 2003.
2. 'Data Ware Housing Fundamentals', Paulraj Ponniah, John Wiley.

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UNIT I

Annuities Certain- present Values- Amounts - Deferred Annuities –Perpetuities - Present Value of an Immediate Annuity Certain – Accumulated Value of Annuity – Relation between S_n and a_n – Present Value of Deferred Annuity Certain – Accumulated Value of a term of n-years – Perpetuity – Present Value of an Immediate Perpetuity of 1p.a. – Present Value of a Perpetuity due of 1 p.a. – Deferred Perpetuity with Deferment Period of m years – Mortality Table – The Probabilities of Survival and Death.

UNIT II

Life Insurance Premiums – General considerations - Assurance Benefits – Pure Endowment Assurance – Endowment Assurance – Temporary Assurance or Term Assurance - Whole Life Assurance – Pure Endowment Assurance – Endowment Assurance – Double Endowment Assurance – Increasing Temporary Assurance – Increasing Whole Life Assurance – Commutation Functions D_x, C_x, M_x and R_x – Expressions for Present Values of Assurance Benefits in terms of Commutation Functions – Fixed Term (Marriage) Endowment – Educational Annuity Plan.

UNIT III

Life Annuities and Temporary Annuities – Commutation Functions N_x – To Find the Present Value of an Annuity Due of Re.1 p.a. for Life – Temporary Immediate Life Annuity – Expression for $a_{x:n}$ – Deferred Temporary Life Annuity – Variable Life Annuity – Increasing Life Annuity – Commutation Function S_x – Increasing Temporary Life Annuity – Tables of Life Annuity and Temporary Life Annuity – Variations in the Present Values of Annuities – Life Annuities Payable at Frequent Intervals.

UNIT IV

Net Premiums for Assurance Plans – Natural Premiums – Level Annual Premium – Symbols for Level Annual Premium under Various Assurance Plans – Mathematical Expressions for level Annual Premium under Level Annual Premium under Various Plans for Sum Assure of Re. 1 – Net Premiums – Consequences of charging level Premium – Consequences of withdrawals – Net Premiums for Annuity Plans – Immediate Annuities – Deferred Annuities.

UNIT V

Premium Conversion tables – Single Premium Conversion tables – Annual Premium Conversion Tables – Policy Values – Two kinds of Policy values – Policy value in symbols – Calculation of Policy Value for Unit Sum Assure – Numerical Example : Retrospective Method and Comparison with Prospective Value – Derivative of Theoretical Expressions for Policy Value, ${}_tV_x$ by the Retrospective Method and Prospective Method – Other Expressions for Policy Value – Surrender Values – Paid up Policies – Alteration of Policy Contracts.

Text Book:

"Mathematical Basis of Life Insurance" By Insurance Institute of India.