SRI RAMAKRISHNA MISSION VIDYALAYA
COLLEGE OF ARTS AND SCIENCE
(Autonomous)
COIMBATORE – 641 020

DEPARTMENT OF MATHEMATICS

Under Choice Based Credit System (CBCS)
2018 – 2019 Onwards

M.Sc. MATHEMATICS

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS) COIMBATORE – 641 020.

For candidates admitted from academic year 2017-2018 onwards

Under New CBCS

Programme	**: M.Sc. Mathematics**		
Course Title	**: CORE 1: ALGEBRA**	**Subject Code: 17PMA1C01**	
Year	**: First Year**	**Semester**	**: I**
Hours/Week	**: 6**	**Credits**	**: 5**

Unit I:

Group Theory: Another counting principle - Sylows Theorem.

Chapter 2: Sections 2.11 and 2.12

Unit II:

Ring Theory: Euclidean Rings- Particular Euclidean Ring - Polynomial Rings - Polynomials over the Rational Field.

Chapter 3: Sections 3.7 to 3.10

Unit III:

Fields: Extension field – Roots of polynomials.

Chapter 5: Sections 5.1 and 5.3

Unit IV:

Fields: More about roots - Elements of Galois Theory.

Chapter 5: Sections 5.5 and 5.6

Unit V:

Linear Transformations: Canonical Forms: Triangular form, Trace and Transpose – Hermitian, Unitary and Normal Transformations.

Chapter 6: Sections 6.4, 6.8 and 6.10

Treatment as in:

Topics in Algebra by I.N. Herstein, John Wiley & Sons, Second Edition, 2006.

References:

1. **Algebra by M. Martin**, Prentice Hall of India, New Delhi, 1991.
2. **A First Course in Abstract Algebra by J. B. Fraleigh**, V Ed., Addison-Wesley Longman, Inc., Reading Massachusetts, 1999.

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS) COIMBATORE – 641 020.

For candidates admitted from academic year 2013-2014 onwards
Under New CBCS

Programme : M.Sc. Mathematics.
Course Title : CORE 2: REAL ANALYSIS **Subject Code : 13PMA1C02**
Year : First Year **Semester : I**
Hours/Week : 6 **Credits : 5**

Riemann Stieltjes Integral

Unit I:

Riemann Stieltjes Integral: Definition and existence of the integral – Properties of the integral – Integration and Differentiation – Integration of vector valued function – Rectifiable curves.

Chapter : 6

Unit II:

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

Chapter : 7

Function of Several Variables:

Unit III:

Linear Transformation – The Contraction principle – The Inverse Function Theorem – Implicit Function Theorem – Determinants – Derivatives of Higher order – Differentiation of integrals.

Chapter: 9

Lebesgue Measure:

Unit IV:

Lebesque Measure: Outer measure – Measurable sets and Lebesque measure – Measurable functions.

Chapter 3: Sections 3.2 - 3.4

Unit V:

Lebesque Integral: The Lebesque integral of a bounded functions over a set of finite measure – integrals of a non-negative functions – General Lebesque integral.

Chapter 4: Sections: 4.2 - 4.4

Treatment as in:

1. Principles of Mathematical Analysis, Walter Rudin, Third Edition, 1976. (**Units I, II and III**)
2. **Real Analysis by H.L. Royden**, 3nd edition, Macmillan, New york, 1988. (**Units IV and V**).

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For candidates admitted from academic year 2017-2018 onwards
Under New CBCS

Programme : M.Sc. Mathematics.
Course Title : CORE 3: ORDINARY DIFFERENTIAL EQUATIONS
Subject Code:17PMA1C03
Year : First Year **Semester : I**
Hours/Week : 6 **Credits : 4**

Unit I:

System of Linear Differential Equations: Introduction - System of first order equations – Existence and Uniqueness theorem – Fundamental Matrix.
Chapter 4: Section 4.1 - 4.5

Unit II:

System of Linear Differential Equations: Non – Homogeneous linear systems: Linear systems with constant co-efficient - Linear systems with periodic co-efficient.
Chapter 4: Section 4.6 - 4.7

Unit III:

Existence and Uniqueness of Solutions: Introduction - Preliminaries-Successive Approximation - Picard's theorem - Non-uniqueness of solutions- Continuation and dependence on initial conditions - Existence of solutions in the large - Existence and Uniqueness of solution of systems.
Chapter 5: Section 5.1 - 5.8

Unit IV:

Boundary Value Problems: Introduction - Sturm Liouville problem – Green's Functions – Non Existence of Solutions.
Chapter 7: Section 7.1 - 7.4

Unit V:

Oscillations of Second Order Equations: Fundamental results - Sturm's Comparision theorem - Elementary linear Oscillations - Comparision theorem of Hille – Wintner Oscillations of X'' + a(t) X=0, Elementary nonlinear oscillations.
Chapter 8: Section 8.1 - 8.6

Treatment as in:

Text book of Ordinary Differential Equations by S.G. Deo,
V. Lakshmikanthan and V. Ragavendra, Tata McGraw-Hill Publishing Company Limited, 2010.

Reference Book:

Ordinary Differential Equations A First Course by D. Somasundaram, Narosa Publishing House, Fourth Edition, New Delhi, 2010.

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For candidates admitted from academic year 2017-2018 onwards
Under New CBCS

Programme : M.Sc. Mathematics.
Course Title : CORE 4: MATHEMATICAL STATISTICS **Subject Code : 17PMA1C04**
Year : First Year **Semester : I**
Hours/Week : 5 **Credits : 4**

Unit I:

Parameters of the Distribution of a Random Variable: Expected values – Moments –The Chebyshev inequality – Absolute moments- order of parameters- Moments of random vectors.

Chapter 3: Sections 3.1 -3.6

Unit II:

Characteristic Functions: Properties of Characteristic functions and moments – Semi invariants – The Characteristic function of the sum of independent random variables – Determination of distribution functions by the characteristic functions- Probability generating functions.

Chapter: 4: Sections 4.1 -4.5, 4.7.

Unit III:

Some Probability Distribution: One point and two point Distributions –The Binomial distribution – The Poisson distribution – Normal Distribution – Uniform Distribution – Gamma Distribution – Beta Distribution.

Chapter: 5 Sections 5.1, 5.2, 5.5 - 5.9.

Unit IV:

Limit Theorems: Stochastic Convergence – Bernoulli's Law of large numbers – Levy Cramer theorem – De Moivre- Laplace theorem – The Lindeberg-Levy theorem.

Chapter: 6 Sections 6.2, 6.3, 6.6, 6.7, 6.8.

Unit V:

The Notion of a Sample: The notion of a statistic – The distribution of the arithmetic mean of independent normally distributed random variables – The Chi- square distribution- Distribution of the statistic ($\overline{X}, S$)- Student's t-distributions.

Chapter: 9 Sections 9.1 - 9.6

Treatment as in:

1. **Probability Theory and Mathematical Statistics, Marek Fisz,** John Wiley, Third Edition, New York, 1963.

Reference Book:

1. **An Introduction to Probability Theory and its Applications, W. Feller,** Vol. I, John Wiley, Third Edition, 1968.

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS) COIMBATORE – 641 020.

For candidates admitted from academic year 2013-2014 onwards
Under New CBCS

Programme : M.Sc. Mathematics.
Course Title : Elective 1: NUMERICAL ANALYSIS **Subject Code : 13PMA1EL1**
Year : First Year **Semester : I**
Hours/Week : 5 **Credits : 4**

Unit I:

Solution of Non-Linear Equations: Method of halving the interval – Method of linear interpolation – Newton's method – Use of X = G(X) form - convergence of Newton's method – Bairstow's method for Quadratic factors – Quotient-difference algorithm.

Chapter 1: Sections 1.2 -1.4, 1.6 – 1.9

Unit II:

Solution of System of Equations: Elimination method – Gauss and Gauss Jordan methods – LU Decomposition method - Methods of iteration – Relaxation method – Set of Non-linear equations.

Chapter 2: Sections 2.3, 2.4, 2.5, 2.10, 2.11, 2.12

Unit III:

Solution of Ordinary Differential Equations: Taylor series method – Euler and Euler Modified methods – Runge-Kutta Methods – Multistep Methods – Milne's method – Adams Moulton method.

Chapter 5: Sections 6.2 – 6.7

Unit IV:

Boundary Value Problems and Characteristic Value Problems:

The shooting method – solution through a set of equations – Derivative of Boundary conditions – Characteristic value problems – Eigen values of a matrix by Iteration.

Chapter 6: Sections 7.2 – 7.5

Unit V:

Types of Partial Differential Equations:

The Heat equation and the Wave equation- Solution Techniques for the Heat equation in One Dimensional – Solving the Vibrating String Problem – Parabolic Equations in Two or Three Dimensions – The Wave Equation in Two Dimensions.

Chapter 8: Sections 8.1 – 8.6

Treatment as in: Applied Numerical Analysis by C.F. Gerald and P.O.Wheatley, Pearson Education, 6th Edition, 2003.

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For candidates admitted from academic year 2013-2014 onwards
Under New CBCS

Programme : M.Sc. Mathematics.
Course Title : CORE 5: COMPLEX ANALYSIS **Subject Code : 13PMA2C05**
Year : First Year **Semester : II**
Hours/Week : 6 **Credits : 5**

Unit I:

Complex Integration: Cauchy's integral formula – local properties of analytic functions – the calculus of residues.
Chapter 4: Sections 2.1 - 2.3, 3.1, 3.2, 3.4, 5.1 - 5.2

Unit II:

Harmonic Functions: Series and product development: power series expansions.
Chapter 4: Sections 6.1- 6.3; Chapter V: Sections 1.1 - 1.3

Unit III:

Partial Fractions and Factorizations – Entire functions.
Chapter 5: Sections 2.1, 2.4, 3.1 - 3.2.

Unit IV:

Conformal Mapping, Dirichlet Problem: Conformal mapping of polygons, A closer look at harmonic functions, The Dirichlet problem
Chapter 6: Sections 2.1, 2.2, 3.1, 3.2, 4.1 and 4.2.

Unit V:

Elliptic Functions: Simply periodic functions, Doubly periodic functions.
Chapter 7: Sections 1.1 - 1.3, 2.1 - 2.4.

Treatment as in:

Complex Analysis by Lars. V. Ahlfors, McGraw Hill, International Edition (Third Edition) 1979.

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For candidates admitted from academic year 2013-2014 onwards
Under New CBCS

Programme : M.Sc. Mathematics. **Subject Code: 13PMA2C06**
Course Title : CORE 6 : PARTIAL DIFFERENTIAL EQUATIONS
Year : First Year **Semester : II**
Hours/Week : 6 **Credits : 5**

Unit I:

Partial Differential Equations- nonlinear PDE of first order compatible system of first order equations- Charpit's method-special type of first order equation- Jacobi method.
Chapter 2: Sections 1, 7, 9, 10, 11 and 13.

Unit II:

Partial Differential Equations of the second order : Linear partial differential equation with constant coefficients - Equations with variable co efficients
Chapter 3: Sections 4 and 5.

Unit III:

Laplace's Equation: Occurrence of Laplace equation in physics –Elementary solution of Laplace equation – Boundary value problem separation of variables-Problems with axial symmetry –Kelvin's theorem –Theory of Green's functions-Relations of Dirichlet problem to calculus of variables –Two dimensional Laplace Equation –Green function for two dimensional equation.
Chapter 4: Sections 1, 2, 4, 5, 6, 7, 8, 9, 11 and 13.

Unit IV:

The Wave Equation: Occurrence of wave function in Physics –Elementary solution one dimensional wave equation vibrating membranes-Application of calculus of variation-Three dimensional problem-General solution of wave equation-Green's function for wave equation-Non homogeneous wave equation.
Chapter 5: Sections 1, 2, 4, 5, 6, 7 and 8.

Unit V:

The Diffusion Equation: Occurrence of Diffusion equation in Physics –Resolution of boundary value problem for diffusion equation-Elementary solution of diffusion equation –Separation of variables-Use of Green's functions.
Chapter 6: Sections 1, 2, 3, 4 and 6.

Treatment as in:

Elements of Partial Differential Equations by I.N. Sneddon, McGraw Hill, 1988.

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For candidates admitted from academic year 2017-2018 onwards
Under New CBCS

Programme	**: M.Sc. Mathematics.**		
Course Title	**: CORE 7: MECHANICS**	**Subject Code**	**:17PMA2C07**
Year	**: First Year**	**Semester**	**: II**
Hours/Week	**: 6**	**Credits**	**: 4**

Unit I:

Introductory Concepts: The Mechanical System - Geometrical co-ordinates – Constraints Virtual Work - Energy.
Chapter 1: Sections 1.1 – 1.5

Unit II:

Lagrange's Equations: Derivation of Lagrange's Equations – Integral of the motion-Natural system and Liouvilles systems & Examples
Chapter 2: Sections 2.1 - 2.3

Unit III:

Hamilton's Equations:
Hamilton's Principle – Hamilton's Equations – Modified Hamilton's Principle – Principle of least action and examples
Chapter 4: Sections 4.1 - 4.3

Unit IV:

Hamilton-Jacobi Theory:
Hamilton's Principle function – The Hamilton – Jacobi Equation.
Chapter 5: Sections 5.1 - 5.2.

Unit V:

Canonical Transformations:
Differential forms and generating functions – Lagrange and Poisson brackets.
Chapter 6: Sections 6.1 - 6.3

Treatment as in:

Classical Dynamics by D. T. Greenwood, Prentice Hall (1985).

Reference Book: Classical Mechanics by Herbert Golstein, Charles poole, John safko, Addson Wesley, Third edition, 2000.

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For candidates admitted from academic year 2013-2014 onwards
Under New CBCS

Programme : M.Sc. Mathematics. **Subject Code:13PMA2C08**
Course Title : Core 8 - Mathematical Software II : (Programming in C++)
Year : First Year **Semester : II**
Hours/Week : 4 **Credits : 3**

Unit I:

Principle of Object Oriented Programming: Object oriented programming paradigm. Basic concepts of object oriented programming structure of C++ program. Tokens – keywords – identities – Basic Data types – User-Defined Data types – Derived Data types – symbolic constants – Type compatibility – Declaration of variables – Dynamic Initialization of variables – reference variables.

Section: 1.4 & 1.5, 3.2 – 3.12

Unit II:

Operators in C++ - Scope Resolution operator – Member Dereferencing operators – Memory Management operators – Type cast operator – Expressions and Implicit conversions – Operator overloading – Operator Precedence. Functions in C++ - Introduction – The main function – Function Prototyping –Call by Reference – Return by Reference – Inline functions – Default Arguments – Constant Arguments.

Section: 3.13 – 3.16, 3.18 – 3.21, 4.1 – 4.8

Unit III:

Classes and Objects: Introduction – Specifying a class – Defining Members Functions – Making an outside function inline – Nesting of Member Functions – Private Member Functions – Arrays within a class – Memory Allocation for Objects – Static Data Members – Static Member Functions – Friendly functions – Returning objects – Const Member Functions. **Constructors and Destructors:** Introduction – Parameterized Constructors - Multiple Constructors in a class – Constructors with Default Arguments.

Section: 5.1, 5.3, 5.4, 5.6 – 5.12, 5.16 – 5.17, 6.1- 6.5.

Unit IV:

Operator Overloading and Type Conversions: Introduction – Defining operators overloading – Overloading Unary operators – Overloading Binary operators using friends – Manipulation of strings using operators. Rules for overloading operators – Type conversion. **Inheritance: Extending Classes:** Introduction – Defining Derived classes – Single Inheritance - Making a private Member inheritable – Multilevel Inheritance – Multiple Inheritance – Hierarchical Inheritance – Hybrid Inheritance.

Sections: 7.1 -7.8, 8.1 – 8.8.

Unit V:

Pointers, Virtual Functions and Polymorphism: Introduction – Pointers to objects – 'This' pointer – pointer to Derived classes – Virtual Functions – Pure Virtual Functions. **Managing Console I / O Operations:** Introduction – C++ Streams – C++ stream classes – Unformatted I / O operations – Formatted console I / O operations – Managing output with Manipulators.

Sections: 9.1 – 9.6, 10.1 – 10.6.

Treatment as in:

Object – Oriented Programming with C ++ by E. Balagurusamy, Tata McGraw – Hill, New Delhi, 1998.

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For candidates admitted from academic year 2017-2018 onwards
Under New CBCS

Course Title : Elective 2: GRAPH THEORY **Course Code:17PMA2EL2**

Year : First Year **Semester : II**

Hours/Week : 5 **Credits : 4**

Unit-I

Graphs and Sub graphs: Graphs and simple graphs –Graph isomorphism – The incidence and adjacency matrix – sub graphs – vertex degree – path, **connection and cycles*.**
Tree: Trees – cut edges and bonds – cut vertices and Cayley's formula.
Chapter I- Section: 1.1-1.7, Chapter II- Section: 2.1-2.4

Unit -II

Connectivity and Blocks, Euler tours and Hamilton cycles: Euler tours and Hamilton cycles.
Chapter III- Section: 3.1-3.2, Chapter IV- Section: 4.1-4.2

Unit -III

Matchings: Matchings*, Matchings and coverings in bipartite graphs and perfect matchings.
Independent sets and Cliques: Independent sets.
Chapter V- Section: 5.1-5.3, Chapter VII- Section: 7.1

Unit -IV

Edge Colourings: Edge Chromatic number and Viging's theorem.
Vertex Colourings: Chromatic number, Brook's theorem, Hajo's Conjecture, Dirac's Theorem, **Chromatic polynomials*,** Girth and Chromatic number.
Chapter VI- Section: 6.1-6.2, Chapter VIII- Section: 8.1-8.5.

Unit -V

Planar graphs: Plane and planer graphs, dual graph, Euler's formula, Kuratowski's Theorem.
Directed graphs: Directed graphs, directed paths and **directed cycles*.**
Chapter IX- Section: 9.1-9.3 and 9.5, Chapter X- Section: 10.1-10.3.

*** denotes self study (Questions may be asked from these portions also)**

Book for study:

J. A. Bondy and U. S. R. Murty, *Graph Theory with applications*, Macmillan Company, 1976.

Books for Reference:

1. R. Balahrishnan and K. Ranganathan, *A text book on Graph Theory*, Springer Verlog, Newyork 2000.
2. R. Gould, *Graph Theory*, The Benjamin/Cummings publications company Califonia, 1988.
3. N. Harlsfield and G. Ringd, *Pearls in Graph Theory*, Academic press, 1990.

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For candidates admitted from academic year 2013-2014 onwards
Under New CBCS

Programme : M.Sc. Mathematics.
Course Title : CORE 9: TOPOLOGY **Subject Code : 13PMA3C09**
Year : Second Year **Semester : III**
Hours/Week : 6 **Credits : 5**

Unit I:

Topological Spaces and Continuous Functions: Topological spaces – Basis for a Topology – The Order topology – The Product topology on X x Y – The Subspace topology – Closed sets and limit points.
Chapter 2: Sections 12 - 17

Unit II:

Topological Spaces and Continuous Functions: Continuous functions – The Product topology – The Metric topology.
Chapter 2: Sections 18 - 20

Unit III:

Connectedness and Compactness: Connected spaces – Connected Subspaces of the real line – Components and Local Connectedness.
Chapter 3: Sections 23 - 25

Unit IV:

Connectedness and Compactness: Compact spaces, Compact Subspaces of the real line – Limit point compactness.
Chapter 3: Sections 26 - 28

Unit V:

Countability and Separation Axioms: The Countability Axioms – The Separation Axioms – The Urysohn Lemma – The UrysohnMetrization theorem.
Chapter 4: Sections 30, 31, 33, 34

Treatment as in:

Topology by James R. Munkres, Prentice Hall of India, New Delhi, 2007.

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For candidates admitted from academic year 2013-2014 onwards
Under New CBCS

Programme : M.Sc. Mathematics. **Subject Code :13PMA3C10**
Course Title : CORE 10: Nonlinear Differential Equations
Year : Second Year **Semester : IV**
Hours/Week : 6 **Credits : 5**

Unit I:

First order systems in two variables and linearization: The general phase plane – some population models – linear approximation at equilibrium points – The general solution of a linear system.

Chapter 2: Sections 2.1 - 2.4

Unit II:

Averaging Methods: An energy balance method for limit cycles – Amplitude and frequency estimates – Slowly varying amplitudes: Nearly periodic solutions – Periodic solutions: Harmonic balance – Equivalent linear equation by harmonic.

Chapter 4: Sections 4.1 - 4.5

Unit III:

Perturbation Methods: Outline of the direct method – Forced Oscillations far from resonance – Forced oscillations near resonance with weak excitation – Amplitude equation for undamped pendulum– Lindstedt's method – The perturbation method and Fourier series.

Chapter 5: Sections 5.1 - 5.4, 5.8, 5.10.

Unit IV:

Stability: Poincare stability – Solutions, paths and norms – Liapunov stability. Stability of linear systems- Stability and boundedness for linear systems- Stability of system with constant coefficients.

Chapter 8: Sections 8.1 – 8.4, 8.6-8.7.

Unit V:

The Existence of Periodic solutions: The Poincare-Bendixson theorem-Atheorem on the existence of a centre-A theorem on the existence of a limit cycle- Van der Pol's equation with large parameter.

Chapter 11: Sections 11.1 – 11.4

Treatment as in:

Nonlinear Ordinary Differential Equations by D.W. Jordan and P. Smith, Clarendon Press, Oxford, Second Edition, 1987.

References:

1. **Differential Equations by G.F. Simmons**, Tata McGraw-Hill, New Delhi, 1979.
2. **Ordinary Differential Equations and Stability Theory by D.A. Sanchez,** Dover, New York, 1968.

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS) COIMBATORE – 641 020.

For candidates admitted from academic year 2016-2017 onwards
Under New CBCS

Programme : M.Sc. Mathematics.
Course Title : CORE 11: COMBINATORICS **Subject Code : 16PMA3C11**
Year : Second Year **Semester : I**
Hours/Week : 6 **Credits : 4**

Unit I:

Selection and Binomial coefficients: Permutations - Ordered selections - Unordered selections - Further remarks on the Binomial theorem - Miscellaneous problems.
Chapter:2 Sections 2.1-2.5.

Unit II:

Paring problems: Pairing within a set - Pairing between sets - An optimal assignment problem - Gale's optimal assignment problem - Further reading .
Chapter: 3 Sections 3.1 -3.5.

Unit III:

Recurrence : Some miscellaneous problems-Fibonacci - type relations - using generating functions - Miscellaneous methods - Counting simple electrical networks.
Chapter: 4 Sections 4.1-4.5.

Unit IV:

The Inclusion –Exclusion principle: The principle - Rook polynomials.
Steiner systems and sphere packing's : Introductory remarks – Steiner system - S(5,8,24).
Chapter: 5 Sections 5.1 , 5.2
Chapter: 7 Sections 7.1 – 7.3

Unit V:

Block design and Error –Correcting codes: Block designs- Square block design- Hadamard configurations- Error- Correcting codes.
Chapter: 6 Sections 6.1 - 6.4

Treatment as in:

A First Course in Combinatorial Mathematics by IAN ANDERSON,
Clorendon press, Oxford,1974 .

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS) COIMBATORE – 641 020.
For candidates admitted from academic year 2017-2018 onwards
Under New CBCS

Programme : M.Sc. Mathematics. **Subject Code :17PMA3C12**
Course Title : Core 12 - Mathematical Software III(MATLAB)
Year : Second Year **Semester : III**
Hours/Week : 5 **Credits : 4**

Unit I:

Introduction: What is MATLAB? - Does MATLAB do symbolic calculations? -Will MATLAB run on my computer? - Where do I get MATLAB? - How do I use this book?-Basic of MATLAB, Input – Output - File types – Platform dependence – General commands.
Chapter I: Section 1.1-1.6

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.
Chapter III: Sections 3.1 – 3.6.

Unit III:

Programming in MATLAB: Scripts and Functions – Script files – Function files – Language specific features – Advanced data objects.
Chapter IV: Sections 4.1 – 4.4.

Unit IV:

Applications: Linear Algebra – Curve fitting and Interpolation – Data analysis and Statistics – Numerical Integration – Ordinary differential equations – Nonlinear Algebraic Equations.
Chapter V: Sections 5.1 – 5.6.

Unit V:

Graphics: Basic 2-D plots – Using subplot to layout multiple graphs – 3-D Plots – Handle Graphics – Saving and Printing Graphs – Errors.
Chapter VI & VII: Sections 6.1 – 6.5.

Treatment as in:

Getting started with MATLAB – A Quick Introduction for Scientists and Engineers by Rudra Pratap, Oxford University Press, 2003.

AND SCIENCE (AUTONOMOUS) COIMBATORE – 641 020.

For candidates admitted from academic year 2013-2014 onwards
Under New CBCS

Programme : M.Sc. Mathematics.
Course Title : CORE 13: FUNCTIONAL ANALYSIS **Subject Code : 13PMA4C13**
Year : Second Year **Semester : IV**
Hours/Week : 6 **Credits : 5**

Unit I:

Banach Spaces: The definition and some examples – Continuous Linear Transformation – The Hahn – Banach theorem.
Chapter 9: Sections 46 – 48

Unit II:

The natural imbedding of N in N** - The Open Mapping Theorem – The conjugate of an operator. **Hilbert spaces**: The Definition and some examples - properties.
Chapter 9: Sections 49 -51 and **Chapter 10: Section 52**

Unit III:

Orthogonal complements – Orthogonal sets – The conjugate space H* - The Adjoint of an Operator.
Chapter 10: Sections 53 – 56

Unit IV:

Self – Adjoint operators – Normal and Unitary operators – Projections
Chapter 10: Sections 57 -59

Unit V:

Finite – dimensional Spectral Theory: Matrices – The Spectral theorem
General Preliminaries on Banach Algebras: The Definition and some examples – Regular and singular elements.
Chapter 11: Sections 60 – 62 and **Chapter 11: Sections 64, 65**

Treatment as in:

Introduction to Topology and Modern Analysis by G. F. Simmons, McGraw Hill publication Company, 1963.

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For candidates admitted from academic year 2017-2018 onwards
Under New CBCS

Programme : M.Sc. Mathematics.
Course Title : CORE 14: MATHEMATICAL METHODS Subject Code :13PMA4C14
Year : Second Year Semester : IV
Hours/Week : 6 Credits : 4

Unit I:

Fourier Transforms, Finite Fourier Transforms, Applications of Fourier Transforms in Initial and Boundary value problems.

Chapter 6: Sections 6.1, 6.4 -6.12, Examples 1 – 5, 13 - 19
Chapter 7: Sections 7.1 - 7.4, Examples 1 - 9
Chapter 8: (Omit miscellaneous exercises.)

Unit II:

Henkel Transforms and finite Hankel Transforms, Applications of Hankel Transforms in Initial and Boundary value problems.

Chapters: 9, 10, 11

Unit III:

Introduction: Definition – Regularity Conditions – Special kinds of Kernels – Eigenvalues and Eigenfunctions – Convolution Integral – The inner or scaler product of two functions. **Integral Equations with Separable Kernels:** Reduction to a system of Algebraic equations – Examples – Fredholm Alternative – Examples – An Approximate Method. **Method of Successive Approximations**: Iterative Scheme – Examples – Volterra Integral Equation – Examples.

Chapter I: Sections 1.1 – 1.6, Chapter II: Sections 2.1 – 2.5 and Chapters III: Sections 3.1 – 3.4

Unit IV:

Application Integral Equation to Ordinary Differential Equation Initial value problems, Boundary value problems – Examples **Singular Integral Equation** Abel integral equation - Examples.

Chapter 5: Sections 5.1 – 5.3 and **Chapter 8: Sections 8.1 – 8.2**

Unit V:

Calculus of Variations: Variation and its properties – Euler's equation – functionals of the form functional dependent on higher order derivatives- functional dependent on the functions of several independent variables variational problem in parametric form.

Chapter 6: Sections 6.1 - 6. 7.

Treatment as in:

1. **Integral transforms by Vasistha and Gupta, Krishna PrakasamMandir** Meerut, 1993-94. For Units I & II.
2. **Linear Integral Equations by Ram P.Kanwal,** Academic Press, New York, 1971. For Units III & IV.
3. **Differential Equations and Calculus of Variations by L.Elsgolts**, Mir Publishers, 1970. For Unit V.

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For candidates admitted from academic year 2013-2014 onwards
Under New CBCS

Programme : M.Sc. Mathematics.
Course Title :Core 15: DIFFERENTIAL GEOMETRY **Subject Code : 13PMA4C15**
Year : Second Year **Semester : IV**
Hours/Week : 5 **Credits : 4**

Unit I:

Curves: Analytic representation, Arc Length, Tangent, Osculating plane, Curvature Torsion, Formulas of Frenet.
Chapter I: Sections 1.1 - 1.6

Unit II:

Contact, Natural equations, Helices, General solutions of the Natural equations, Evolutes and Involutes.
Chapter I: Sections 1.7 -1.11

Unit III:

Elementary Theory of surfaces: Analytic Representation, First Fundamental form, Normal tangent plane, Developable surfaces.
Chapter II: Sections 2.1 - 2.4

Unit IV:

Second fundamental form, Meusnier's theorem, Euler's theorem. Dupin's indicatrix, some surfaces. The fundamental equations; the equations of Gauss – Weingarten.
Chapter II: Sections 2.5 - 2.8 and **Chapter III: Sections 3.1 - 3.2**

Unit V:

The theorem of Gauss and the equations of Codazzi, Some applications of the Gauss and Codazzi equations. The fundamental theorem of surface theory – Geodesic curvature, Geodesics.
Chapter III: Sections 3.3, 3.5, 3.6 and **Chapter IV: Sections 4.1 to 4.2**

Treatment as in:

Lectures on Classical Differential Geometry by Dirk,J.Struik, Addison Wesley Publishing Company, 1961.

Reference Book:

1. **Differential Geometry: First Course by D. Somasunduram**, Narosa Publishing House, 2010.
2. **Differential Geometry : An Integrated Approach by Nirmala Prakash**, Tata McGraw-Hill Publishing Company Ltd. Fourth Reprint, 1992.

SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS) COIMBATORE – 641 020.
For candidates admitted from academic year 2013-2014 onwards
Under New CBCS

Programme : M.Sc. Mathematics.
Course Title : Elective:4 FLUID DYNAMICS **Subject Code :13PMA4EL4**
Year : Second Year **Semester : IV**
Hours/Week : 6 **Credits : 4**

Unit I:

Introductory notions – Velocity – Stream lines, and Path of the particle - Stream tubes and Filaments – Fluid body – Density - Pressure, Differentiation with respect to time – Equation of continuity - Boundary conditions(Kinematical and Physical) - Rate of change of linear momentum – Equation of motion of an inviscid Fluid.
Chapter I: Sections 1.0 – 1.3, Chapter III: Sections 3.10, 3.20, 3.30, 3.31, 3.40, 3.41

Unit II:

Euler's Momentum theorem - Conservative forces – Steady motion (Bernoulli's equation) – The Energy equation – Rate of Change of Circulation (Kelvin's theorem) – Vortex motion - Permanence of Verticity (Helmholtz Equation).
Chapter IIII: Sections 3.42, 3.43, 3.45, 3.50, 3.51, 3.52, 3.53

Unit III:

Two dimensional motions – Two dimensional functions – complex potential basic singularities – source vertex – doublet circle theorem – flow past a circular cylinder with circulation – conformal transformation – Blasius theorem – Lift force.
Chapter 3: Sections 3.1 – 3.7.5 (omit 3.4 , 3.5 , 3.5.3 and 3.6)

Unit IV:

Viscous flows – Navier stokes equations – Vorticity and Circulation in a viscous fluid – steady flow through an arbitrary cylinder under pressure – steady couette flow between cylinders in relative motion – steady flow between parallel planes.
Chapter 5: Sections 5.2 – 5.3.3

Unit V:

Laminar boundary layer in incompressible flow boundary layer concept – Boundary layer equations – Displacement thickness – Momentum thickness – Kinetic energy thickness – Integral equation of boundary layer – Flow parallel to semi infinite flat plate - Blasius equation and it's solution.
Chapter 6: Sections 6.2.1, 6.2.3, 6.2.4, 6.3.1

Treatment as in:

1. **Theoretical Hydrodynamics by L.M. Milne Thomson**, Macmillan Company, 5th Edition, 1968. For Units I and II.
2. **Modern Fluid Dynamics – Vol I by N. Curle and H.J. Davies**, D Van Nostrand Company Ltd; London, 1968. For Units III, IV and V

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For candidates admitted from academic year 2013-2014 onwards
Under New CBCS

Programme : M.Sc. Mathematics.
Course Title : ELECTIVE 5:CONTROL THEORY **Subject Code : 13PMA4EL5**
Year : Second Year **Semester : IV**
Hours/Week : 5 **Credits : 4**

Unit I:

Observability: Linear systems – Observability Grammian – Constant coefficient systems – Reconstruction kernel – Nonlinear systems.
Chapter 2: Sections 2.1- 2.2

Unit II:

Controllability: Linear systems – Controllability Grammian – Adjoint systems – Constant coefficient systems – Steering function – Nonlinear systems.
Chapter 3: Sections 3.1- 3.2

Unit III:

Stability: Stability – Uniform Stability – Asymptotic Stability of Linear systems – Linear time varying systems – Perturbed linear systems – Nonlinear systems.
Chapter 4: Sections 4.1- 4.3

Unit IV:

Stabilizability: Stabilization via linear feedback control – Bass method – Controllable subspace – Stabilization with restricted feedback.
Chapter 5: Sections 5.1- 5.3

Unit V:

Optimal Control: Linear time varying systems with quadratic performance criteria – Matrix Riccati equation – Linear time invariant systems – Non linear systems.
Chapter 6: Sections 6.1- 6.3

Treatment as in:

Elements of Control Theory by K. Balachandran and J.P.Dauer, Narosa, 2nd Edition, New Delhi.