

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



**DEPARTMENT OF MATHEMATICS**

**Under Choice Based Credit System (CBCS)  
2016 – 2017 Onwards**

**M.Sc. MATHEMATICS**

**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**

<b>Programme</b>	<b>: M.Sc. Mathematics</b>	
<b>Course Title</b>	<b>: CORE 1: ALGEBRA</b>	<b>Subject Code: 13PMA1C01</b>
<b>Year</b>	<b>: First Year</b>	<b>Semester : I</b>
<b>Hours/Week</b>	<b>: 6</b>	<b>Credits : 5</b>

**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:** Trace and Transpose – Hermitian, Unitary and  
Normal Transformations.

**Chapter 6: Sections 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  
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**For candidates admitted from academic year 2013-2014 onwards  
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**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:**

**Reimann 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**

**Unit IV:**

**Lebesgue Measure:** Outer measure – Measurable sets and Lebesgue measure – Measurable functions.

**Chapter 3: Sections 3.2 - 3.4**

**Unit V:**

**Lebesgue Integral:** The Lebesgue integral of a bounded functions over a set of finite measure – integrals of a non-negative functions – General Lebesgue 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, 3<sup>rd</sup> edition, Macmillan, New york, 1988. (Units IV and V).

**SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS  
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**For candidates admitted from academic year 2013-2014 onwards  
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**Programme : M.Sc. Mathematics.**

**Course Title : CORE 3: ORDINARY DIFFERENTIAL EQUATIONS**

**Subject Code: 13PMA1C03**

**Year : First Year**

**Semester : I**

**Hours/Week : 6**

**Credits : 5**

**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:** 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 5.3 - 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 Comparison theorem - Elementary linear Oscillations - Comparison theorem of Hille – Wintner Oscillations of  $X'' + a(t)X = 0$ , Elementary nonlinear oscillations.

**Chapter 8: Section 8.1 - 8.6**

**Treatment as in:**

**Ordinary Differential Equations and Stability Theory by S.G. Deo 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 2016-2017 onwards  
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**Programme : M.Sc. Mathematics.**

**Course Title : CORE 4: MATHEMATICAL  
STATISTICS**

**Subject Code : 16PMA1C04**

**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 – Gamma Distribution – Beta Distribution.

**Chapter: 5 Sections 5.1, 5.2, 5.5, 5.7, 5.8, 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  $(\bar{X}, S)$ - 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.**
2. **Stochastic Processes, J.L. Doob, Wiley Inter Science, 1990.**

**SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS  
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**For candidates admitted from academic year 2013-2014 onwards  
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**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, 6<sup>th</sup> Edition, 2003.**

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**For candidates admitted from academic year 2013-2014 onwards  
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**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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<b>Programme</b>	<b>: M.Sc. Mathematics.</b>	<b>Subject Code:</b>	<b>13PMA2C06</b>
<b>Course Title</b>	<b>: CORE 6 : PARTIAL DIFFERENTIAL EQUATIONS</b>		
<b>Year</b>	<b>: First Year</b>	<b>Semester</b>	<b>: II</b>
<b>Hours/Week</b>	<b>: 6</b>	<b>Credits</b>	<b>: 5</b>

**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 coefficients  
**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 2013-2014 onwards  
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**Programme : M.Sc. Mathematics.**

**Course Title : CORE 7: MECHANICS**

**Year : First Year**

**Hours/Week : 6**

**Subject Code : 13PMA2C07**

**Semester : II**

**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.

**Chapter 2: Sections 2.1 - 2.3(omit natural system and Liouville's system & Examples)**

**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).**

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**For candidates admitted from academic year 2013-2014 onwards  
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**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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**Programme : M.Sc. Mathematics.**

**Course Title : Elective 2: GRAPH THEORY**

**Year : First Year**

**Hours/Week : 5**

**Subject Code : 13PMA2EL2**

**Semester : II**

**Credits : 4**

**Unit I:**

Introduction - **Paths and Circuits**

**Chapter1: Sections 1.1 -1.5**

**Chapter 2: Sections 2.1- 2.2, 2.4-2.10**

**Unit II:**

Trees and fundamental circuits - Cut sets and cut vertices

**Chapter3: Sections 3.1 -3.4, 3.7-3.10**

**Chapter 4: Sections4.1 -4.5**

**Unit III:**

**Planar** and Dual graphs -Vector spaces of a graph -

**Chapter 5: Sections 5.1 -5.4, 5.6-5.9**

**Chapter 6: Sections 6.1 – 6.9**

**Unit IV:**

**Matrix representation of graph** -Coloring, Covering and Partitioning

**Chapter 7: Sections 7.1 – 7.9**

**Chapter 8: Sections 8.1- 8.6**

**Unit V:**

**Direct graph**

**Chapter 9: Sections 9.1- 9.5, 9.8-9.11**

**Treatment as in:**

**Graph Theory with Applications to Engineering and Computer Science  
by Narsingh Deo, Prentice Hall, 2007.**

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**For candidates admitted from academic year 2013-2014 onwards  
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**Programme : M.Sc. Mathematics.**

**Course Title : CORE 9: TOPOLOGY**

**Year : Second Year**

**Hours/Week : 6**

**Subject Code : 13PMA3C09**

**Semester : III**

**Credits : 5**

**Unit I:**

**Topological Spaces and Continuous Functions:** 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 - 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 Urysohn Metrization 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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<b>Programme</b>	<b>: M.Sc. Mathematics.</b>	<b>Subject Code</b>	<b>:13PMA3C10</b>
<b>Course Title</b>	<b>: CORE 10: Nonlinear Differential Equations</b>		
<b>Year</b>	<b>: Second Year</b>	<b>Semester</b>	<b>: IV</b>
<b>Hours/Week</b>	<b>: 6</b>	<b>Credits</b>	<b>: 5</b>

**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- A theorem 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.

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**For candidates admitted from academic year 2016-2017 onwards  
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**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:**

**Pairing 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,  
Clarendon press, Oxford,1974 .**

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**For candidates admitted from academic year 2013-2014 onwards  
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<b>Programme</b>	<b>: M.Sc. Mathematics.</b>	<b>Subject Code</b>	<b>:13PMA3C12</b>
<b>Course Title</b>	<b>: CORE 12: Mathematical Software – III MATLAB</b>		
<b>Year</b>	<b>: Second Year</b>	<b>Semester</b>	<b>: III</b>
<b>Hours/Week</b>	<b>: 5</b>	<b>Credits</b>	<b>: 4</b>

**Unit I:**

**Introduction:** Basic of MATLAB, Input – Output - File types – Platform dependence – General commands.

**Chapter I: Section 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.

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**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 2013-2014 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 - 18**

**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 scalar 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 Prakasam Mandir 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.

**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 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,  
Evolutives and Involutives.

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

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

**Programme : M.Sc. Mathematics.**

**Course Title : Elective:4 FLUID DYNAMICS**

**Year : Second Year**

**Hours/Week : 6**

**Subject Code :13PMA4EL4**

**Semester : IV**

**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 Vorticity (Helmholtz Equation).

**Chapter III: 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 vortex – 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, 5<sup>th</sup> 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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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 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, 2<sup>nd</sup> Editio, New Delhi.**