

Department of Mathematics

The National College, Autonomous

Jayanagar, Bangalore 560070



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Syllabus

1SMAT1T: Mathematics Paper – 1		
Total Teaching Hours: 56	No. Of Lecture Hours/Week: 04	
Max Marks: 70	Credits: 4	
Course Outcome:		
<ul style="list-style-type: none"> The students are introduced to the concepts of Abstract Algebra such as Groups, Subgroups and their properties. The paper provides basic knowledge about Differential and Integral Calculus and 3-dimensional Analytical Geometry. 		
UNIT 1: ALGEBRA - I		Teaching Hours :14
Group Theory: Binary operation, algebraic structure-problems on finding identity and inverse. Definitions of semigroup and group, abelian group – problems on finite and infinite groups. Properties of group with proof – standard problems on groups – A finite semigroup with both the cancellation laws in a group – Any group of order less than five is abelian. Subgroups- theorems on subgroups (with proof)- problems.		
UNIT 2: CALCULUS I		Teaching Hours :28
a) Differential Calculus: Successive Differentiation – n^{th} derivatives of the functions: e^{ax} , $(ax + b)^n$, $\log(ax + b)$, $\sin(ax + b)$, $\cos(ax + b)$, $e^{ax} \sin(bx + c)$, $e^{ax} \cos(bx + c)$ – Problems Leibnitz theorem (with proof) and its applications. Partial differentiation –Function of two and three variables - First and higher derivatives - Homogeneous functions – derivatives- Euler's theorem and its extension (with proof) - Total derivative and differential - Differentiation of implicit functions and composite functions – Problems - Jacobians – Properties of Jacobians problems.		
b) Integral Calculus: Reduction formulae for the integrals $\int \sin^n x \, dx$, $\int \cos^n x \, dx$, $\int \tan^n x \, dx$, $\int \cot^n x \, dx$, $\int \sec^n x \, dx$, $\int \operatorname{cosec}^n x \, dx$, $\int \sin^m x \cos^n x \, dx$ with definite limit. Differentiation under integral sign by Leibnitz rule.		
UNIT 3: GEOMETRY		Teaching Hours 14
Analytical Geometry of Three Dimensions: Recapitulation of elements of three-dimensional geometry - Different forms of equations of straight line and plane. Angle between two planes - Line of intersection of two planes - Plane coaxial with given planes - Planes		

bisecting the angle between two planes - Angle between a line and a plane - Co planarity of two lines - Shortest distance between two lines.

Equation of the sphere in general and standard forms - equation of a sphere with given ends of a diameter. Tangent plane to a sphere, orthogonality of spheres.

Standard equations of right circular cone and right circular cylinder.

Text Books:

1. Shanti Narayan and P K Mittal, Text book of Matrices, 5th edition, New Delhi, S Chand and Co. Pvt. Ltd., 2013.
2. Shanthi Narayan and P K Mittal, Differential Calculus, Reprint. New Delhi: S. Chand and Co. Pvt. Ltd., 2014.
3. Shanthi Narayan and P K Mittal, Analytical Solid Geometry. New Delhi: S. Chand and Co. Pvt. Ltd., 2014.
4. www.scilab.org
5. wxmaxima.sourceforge.net
6. www.geogebra.org

Reference Text Books:

1. B S Vatssa, Theory of Matrices, New Delhi: New Age International Publishers, 2005.
2. A R Vashista, Matrices, Krishna Prakashana Mandir, 2003.
3. N P Bali, Differential Calculus, India: Laxmi Publications (P) Ltd, 2010
4. S Narayanan & T. K. Manicavachogam Pillay, Calculus.: S. Viswanathan Pvt. Ltd., vol. I & II 1996.
5. Frank Ayres and Elliott Mendelson, Schaum's Outline of Calculus, 5th ed. USA: Mc. Graw Hill., 2008.

2SMAT2T: Mathematics Paper – 2	
Total Teaching Hours : 56	No. Of Lecture Hours/Week: 04
Max Marks: 70	Credits : 4
Course Outcome:	
<ul style="list-style-type: none"> The students are introduced to concepts of Matrices and Differential Equations. The paper also provides topics on Calculus in continuation of Paper 1. 	
UNIT 1: 1. ALGEBRA II	Teaching Hours :14
<p>Elementary row and column transformations (operations), equivalent matrices, theorems on it. Row- reduced echelon form, Normal form of a matrix, Rank of a matrix, Problems.</p> <p>Homogeneous and Non – Homogeneous systems of linear equations in n unknowns consistency criterion – criterion for uniqueness of solutions. Solution of the same by elimination method.</p> <p>Eigen values and Eigenvectors of a square matrix of order 2 and 3, standard properties, Cayley-Hamilton theorem (with proof). Finding inverse of matrix and also A^2, A^3, A^4.</p>	
UNIT 2: CALCULUS II	Teaching Hours :28
<p>a) Differential Calculus: Polar coordinates - Angle between the radius vector and the tangent - Angle of intersection of curves (polar form) polar sub-tangent and polar subnormal- perpendicular from pole on the tangent - Pedal equations. Derivative of an arc in Cartesian, parametric and polar forms. Curvature of plane curves - formula for radius of curvature in Cartesian, parametric, polar and pedal forms - centre of curvature - evolutes. Singular points– Asymptotes – Envelopes. General rules for tracing of curves.</p> <p>b) Integral Calculus: Applications of Integral Calculus: computation of length of arc, plane area and surface area and volume of solids of revolutions for standard curves in Cartesian and polar forms.</p>	
UNIT 3: DIFFERENTIAL EQUATIONS – I	Teaching Hours 14
<p>Solutions of ordinary differential equations of first order and first degree:</p> <ol style="list-style-type: none"> Linear equations, Bernoulli equation and those reducible to these. Exact equations (excluding reducible to Exact) 	

Equations of first order and higher degree – nonlinear first order, higher degree – (Mention) solvable for p - solvable for y - solvable for x - Clairaut's equation singular solution - Geometric meaning. Orthogonal trajectories in Cartesian and polar forms.

Essential Textbook:

1. Herstein I N, Topics in Algebra, 4th ed. New Delhi, India: Vikas Publishing House Pvt. Ltd, 1991.
2. Shanthi Narayan and P K Mittal, Differential Calculus, Reprint. New Delhi: S Chand and Co. Pvt. Ltd., 2014.
3. Shanthi Narayan and P K Mittal, Integral Calculus, Reprint. New Delhi: S.Chand and Co. Pvt. Ltd., 2013.
4. M D Raisinghania, Ordinary and Partial Differential Equations, S Chand and Co. Pvt. Ltd., 2014.
5. www.scilab.org
6. wxmaxima.sourceforge.net
7. www.geogebra.org

Reference Text Books:

1. Michael Artin, Algebra, 2nd ed. New Delhi, India: PHI Learning Pvt. Ltd., 2011.
2. Ltd., 2011.
3. Vashista, A First Course in Modern Algebra, 11th ed.: Krishna Prakasan
4. Mandir, 1980.
5. John B Fraleigh, A First course in Abstract Algebra, 3rd ed.: Narosa
6. Publishing House., 1990.
7. R Balakrishnan and N.Ramabadran, A Textbook of Modern Algebra, 1st ed.
8. NewDelhi, India: Vikas publishing house pvt. Ltd., 1991.
9. G B Thomasand R L Finney, Calculus and analytical geometry, Addison
10. Wesley, 1995.
- 11.12. F Ayres, Schaum's outline of theory and problems of Differential Equations, 1st ed. USA: McGraw-Hill, 2010.
- 12.14. G F Simmons, Differential equation with Applications and historical notes, 2n ed.: McGraw-Hill Publishing Company, Oct 1991.

3SMAT3T: Mathematics Paper – 3	
Total Teaching Hours: 56	No. Of Lecture Hours/Week: 04
Max Marks: 70	Credits: 4
Course Outcome:	
<ul style="list-style-type: none"> • The students are introduced to the concepts of Abstract Algebra such as Order of an element of a Group, Cyclic Groups, Cosets and Lagrange's theorem and its consequences. • The paper provides basic knowledge about Sequences and Series of Real Numbers. • The paper also provides topics on Differential Equations in continuation of Paper 2. 	
UNIT 1: ALGEBRA III	Teaching Hours :14
Groups: Order of an element of a group – properties related to order of an element-subgroup generated by an element of a group –coset decomposition of a group, Cyclic groups- properties- modulo relation- index of a group –Lagrange's theorem- consequences.	
UNIT 2: ANALYSIS I	Teaching Hours :28
a) Sequences of Real Numbers: Definition of a sequences-Bounded sequences- limit of a sequences- convergent, divergent and oscillatory sequences- Monotonic sequences and their properties- Cauchy's criterion. b) Series of Real Numbers: Definition of convergence, divergence and oscillation of series -properties of Convergence series - properties of series of positive terms – Geometric series Tests for convergence of p- series - comparison test. D'Alembert's test, Raabe's test, Cauchy's root - Absolute and conditional convergence-D'Alembert test for absolute convergence - Alternating series - Leibnitz test. Summation of binomial, exponential and logarithmic series.	
UNIT 3: CALCULUS III	Teaching Hours 14
a) Differential Calculus: Recapitulation of Equivalence Class and partition of a set. Definition of the limit of a function in ϵ - δ form –continuity- types of discontinuities. Properties of continuous function on a closed interval (boundedness, attainment of bounds and taking every value between bounds). Differentiability -Differentiability implies Continuity – Converse not true. Rolle's Theorem- Lagrange's and Cauchy's	

First Mean Value Theorem (Lagrange's form) - Maclaurin's expansion. Evaluation of limits by L'Hospital's rule

Essential Text Book:

1. Herstein I N, Topics in Algebra, 4th ed. New Delhi, India: Vikas Publishing House Pvt. Ltd, 1991.
2. Boumslag and Chandler, Schaum's outline series on groups, 2010.
3. S.C.Malik and Savita Arora, Mathematical Analysis, 2nd ed. New Delhi, India: New Age international (P) Ltd., 1992
4. Shanthi Narayan and P K Mittal, Differential Calculus, Reprint. New Delhi: S.Chand and Co. Pvt. Ltd., 2014.
5. www.scilab.org.
6. wxmaxima.sourceforge.net
7. www.geogebra.org

Reference Text Books:

1. Michael Artin, Algebra, 2nd ed. New Delhi, India: PHI Learning Pvt. Ltd., 2011.
2. Vashista, A First Course in Modern Algebra, 11th ed.: Krishna Prakasan Mandir, 1980.
3. John B Fraleigh, A First course in Abstract Algebra, 3rd ed.: Narosa Publishing House., 1990.
4. R Balakrishnan and N.Ramabadran, A Textbook of Modern Algebra, 1st ed. New Delhi, India: Vikas publishing house pvt. Ltd., 1991.
5. Richard R Goldberg, Methods of Real Analysis, Indian ed. New Delhi, India: Oxford and IBH Publishing Co., 19

4SMAT4T: Mathematics Paper – 4	
Total Teaching Hours: 56	No. Of Lecture Hours/Week: 04
Max Marks: 70	Credits: 4
Course Outcome:	
<ul style="list-style-type: none"> The students are introduced to the concepts of Abstract Algebra such as Normal Subgroups, Homomorphism, Isomorphism and Cayley Theorem. The students are exposed to topics such as Fourier Series and Mathematical Methods such as Laplace Transforms. The paper also provides topics on Advanced Differential Calculus in continuation of Paper 2 including Mean Value theorems, L'Hospital's Rule, etc.. 	
UNIT 1: ALGEBRA IV	Teaching Hours :14
Groups: Normal subgroups-examples and problems –Quotient group-Homomorphism and Isomorphism of groups-Kernel and image of a homomorphism-Normality of the Kernel-Fundamental theorem of homomorphism- properties related to isomorphism-Permutation group-Cayley's theorem.	
UNIT 2: ANALYSIS II	Teaching Hours :09
Fourier Series: Trigonometric Fourier series of functions with period 2π and period $2L$, Half range Cosine and sine series.	
UNIT 3: CALCULUS IV	Teaching Hours 09
Differential Calculus: Continuity and differentiability of a function of two and three variables – Taylor's Theorem and expansion of functions of two variables- Maxima and Minima of functions of two variables. Method of Lagrange multipliers.	
UNIT 4: MATHEMATICAL METHODS I	Teaching Hours :10
Definition and basic properties Laplace transform of some common functions and Standard results –Laplace transform of periodic functions- Laplace transforms of derivatives & the integral of function- Laplace transforms, Heaviside function convolution theorem (statement only) Inverse Laplace transforms and its applications.	
UNIT 5: DIFFERENTIAL EQUATIONS II	Teaching Hours :14

Second and higher order ordinary linear differential equations with constant Coefficients- complementary function- particular integrals (standard types) Cauchy-Euler differential equation. Simultaneous linear differential equations (two variables) with constant coefficients. Solutions of second order ordinary linear differential equations with variable coefficients by the following methods.

- i. When a part of complementary function is given
- ii. Changing the independent variable
- iii. Changing the dependent variable
- iv. Variation of parameters
- v. Conditions for exactness and the solution when the equation is exact.

Essential Text Book:

1. Herstein I N, Topics in Algebra, 4th ed. New Delhi, India: Vikas Publishing House Pvt. Ltd, 1991.
2. Broumshlag and Chandler, Schaum's outline series on groups, 2010.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 8th ed. New Delhi, India: Wiley India Pvt. Ltd., 2010.
4. Shanthi Narayan and P K Mittal, Differential Calculus, Reprint. New Delhi: S Chand and Co. Pvt. Ltd., 2014.
5. M D Raisinghania, Ordinary and Partial Differential Equations, S.Chand and Co. Pvt. Ltd., 2014.
6. www.scilab.org.
7. wxmaxima.sourceforge.net
8. www.geogebra.org

Reference Text Books:

1. Michael Artin, Algebra, 2nd ed. New Delhi, India: PHI Learning Pvt. Ltd., 2011.
2. Vashista, A First Course in Modern Algebra, 11th ed.: Krishna Prakasan Mandir, 1980.
3. John B Fraleigh, A First course in Abstract Algebra, 3rd ed.: Narosa Publishing House., 1990.
4. R Balakrishnan and N.Ramabadran, A Textbook of Modern Algebra, 1st ed. New Delhi, India: Vikas publishing house pvt. Ltd., 1991.
5. J Edwards, An elementary treatise on the differential calculus: with applications and numerous example, Reprint. Charleston, USA: BiblioBazaar, 2010.

5SMAT5T: Mathematics Paper – 5	
Total Teaching Hours: 42	No. Of Lecture Hours/Week: 04
Max Marks: 70	Credits: 4
Course Outcome:	
<ul style="list-style-type: none"> The students are introduced to the concepts of Abstract Algebra such as Rings, Integral Domains and Fields. The paper also provides concepts on Vector differential Calculus and Numerical Methods. 	
UNIT 1: ALGEBRA V	Teaching Hours :14
Rings, Integral Domains, Fields: Rings, Types of Rings, properties of rings – Rings of integers modulo n – Subrings – Ideals, Principal, Prime and Maximal ideals in a commutative ring – examples and standard properties following the definition – Homomorphism, Isomorphism – Properties – Quotient rings – Integral Domain – Fields – properties following the definition – Fundamental Theorem of Homomorphism of Rings – Every field is an integral domain – Every finite integral domain is a field – Problems.	
UNIT 2: CALCULUS V	Teaching Hours :14
Scalar field – gradient of a scalar field, geometrical meaning – directional derivative – Maximum directional derivative – Angle between two surfaces – vector field– divergence and curl of a vector field – solenoidal and irrotational fields – scalar and vector potentials – Laplacian of a scalar field – vector identities. Standard properties, Harmonic functions, Problems.	
UNIT 3: NUMERICAL METHODS - I	Teaching Hours 14
Finite differences – Definition and properties of $\Delta, \nabla, \delta, \mu$ and E , the relation between them – The n th differences of a polynomial, Factorial notations, separation of symbols, divided differences and related theorems. Newton –Gregory forward and backward interpolation formulae – Lagrange's and Newton's interpolation formulae for unequal intervals - Inverse interpolation. Numerical Integration: Quadrature formula – Trapezoidal rule -Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule and problems.	

Essential Text Book:

1. Herstein I N, Topics in Algebra, 4th ed. New Delhi, India: Vikas Publishing House Pvt. Ltd, 1991.
2. Shanthi Narayan and P K Mittal, Differential Calculus, Reprint. New Delhi: S Chand and Co. Pvt. Ltd., 2014.
3. M D Raisinghania, Vector calculus, S Chand Co. Pvt. Ltd., 2013.
4. M K Jain, S R K Iyengar, and R K Jain, Numerical Methods for Scientific and Engineering Computation, 4th ed. New Delhi, India: New Age International, 2012.
5. www.scilab.org.
6. wxmaxima.sourceforge.net
7. www.geogebra.org

Reference Text Books:

1. Michael Artin, Algebra, 2nd ed. New Delhi, India: PHI Learning Pvt. Ltd., 2011.
2. Vashista, A First Course in Modern Algebra, 11th ed.: Krishna Prakasan Mandir, 1980.
3. John B Fraleigh, A First course in Abstract Algebra, 3rd ed.: Narosa Publishing House., 1990.
4. R Balakrishnan and N. Ramabadran, A Textbook of Modern Algebra, 1st ed. New Delhi, India: Vikas publishing house pvt. Ltd., 1991.
5. G B Thomas and R L Finney, Calculus and analytical geometry, Addison Wesley, 1995.
6. B Spain, Vector Analysis, ELBS, 1994.
7. D E Bournes and, P C Kendall, Vector Analysis, ELBS, 1996.
8. S S Sastry, Introductory methods of Numerical Analysis, Prentice Hall of India, 2012.

6SMAT6T: Mathematics Paper – 6		
Total Teaching Hours: 42	No.	Of Lecture Hours/Week: 04
Max Marks: 70	Credits: 4	
Course Outcome:		
<ul style="list-style-type: none">• The students are introduced to the concepts of Variational problems, Geodesics and Isoperimetric problems.• The paper also provides concepts on Advanced Calculus such as Line and Multiple Integrals and Integral Theorems.		
UNIT 1: MATHEMATICAL METHODS II		Teaching Hours :14
Calculus of Variation: Variation of a function $f = f(x, y, y^2)$ – variation of the corresponding functional – extremal of a functional – variational problem – Euler’s equation and its particular forms – Examples – standard problems like geodesics, minimal surface of revolution, hanging chain, Brachistochrone problem – Isoperimetric problems.		
UNIT 2: CALCULUS VI		Teaching Hours :28
Line and Multiple Integrals: Definition of line integral and basic properties examples evaluation of line integrals. Definition of double integral – its conversion to iterated integrals. Evaluation of double integrals by change of order of integration and by change of variables – computation of plane and surface areas, volume underneath a surface and volume of revolution using double integrals. Definition of triple integral and evaluation – change of variables.		
Integral Theorems: Green’s theorem (with proof) - Direct consequences of the theorem. The Divergence theorem (with proof) – Direct consequences of the theorem. The Stokes’ theorem (with proof) - Direct consequences of the theorem.		
<i>Essential Text Book:</i>		
<ol style="list-style-type: none">1. R Weinstock,Calculus of Variation, Dover, 1970.2. M. D. Raisinghania, Vector Calculus, S Chand Co. Pvt. Ltd., 2013.3. www.scilab.org4. wxmaxima.sourceforge.net5. www.geogebra.org		
<i>Reference Text Books:</i>		

1. F B Hildebrand, Methods in Applied Mathematics,
2. B Spain, Vector Analysis , ELBS, 1994.
3. D E Bournesand, P C Kendall, Vector Analysis, ELBS, 1996.

7SMAT7T: Mathematics Paper – 7		
Total Teaching Hours : 52	No. Of Lecture Hours/Week: 04	
Max Marks: 70	Credits : 4	
Course Outcome:		
<ul style="list-style-type: none"> The students are introduced to the concepts of Linear Algebra such as Vector Spaces, Linear Transformations along with Standard Theorems. The paper also provides concepts on Partial Differential Equations and their applications. 		
UNIT 1: ALGEBRA V		Teaching Hours :12
Linear Algebra: Vector space – Examples – Properties – Subspaces – criterion for a subset to be a subspace – linear span of a set – linear combination – linear independent and dependent subsets – Basis and dimensions– Standard properties – Examples illustrating concepts and results. Linear transformations – properties – matrix of a linear transformation – change of basis – range and kernel – rank and nullity – Rank – Nullity theorem – Non-singular and singular linear transformations - Standard properties – Examples.		
UNIT 2: DIFFERENTIAL EQUATIONS III		Teaching Hours :12
<p>Orthogonal Curvilinear Coordinates: Definition of orthogonal curvilinear coordinates. Fundamental vectors or base vectors, Scale factors or material factors - quadratic differential form. Spherical curvilinear system: Cartesian, Cylindrical – conversion of Cylindrical to orthogonal Spherical polar coordinates. Theorem: The Spherical coordinate system is orthogonal curvilinear coordinate system, statement and problems.</p> <p>Partial Differential Equations: Total differential equations-Necessary condition for the equation $Pdx + Qdy + Rdz = 0$ to be integrable-Simultaneous equations. Formation of partial differential equation. Equations of First Order Lagrange's linear equation – Charpit's method, Standard types of first order non-linear partial differential equation (By known substitution).</p> <p>Solution of second order linear partial differential equations in two variables with constant coefficients by finding complementary function and particular integral. Solution of one – dimensional heat equations, Solution of one – dimensional wave equations using Fourier series.</p>		

Essential Text Book:

1. Krishnamoorthy V K and Mainra V P and Arora J L, An Introduction to Linear Algebra, Reprint. New Delhi, India: Affiliated East West Press Pvt. Ltd., 2003.
2. M. D. Raisinghania, Vector Calculus, S Chand Co. Pvt. Ltd., 2013.
3. M D Raisinghania, Ordinary and Partial Differential Equations, S Chand and Co. Pvt. Ltd., 2014.
4. www.scilab.org
5. wxmaxima.sourceforge.net
6. www.geogebra.org

Reference Text Books:

1. G Strang, MIT open courseware (<http://ocw.mit.edu/courses>).
2. B Spain, Vector Analysis , ELBS, 1994.
3. D E Bournes and, P C Kendall, Vector Analysis, ELBS, 1996.
4. Frank Ayres, Schaum's outline of theory and problems of Differential Equations, 1st ed. USA: McGraw-Hill, 1972.
5. GF Simmons, Differential equation with Applications and historical notes, 2nd ed.: McGraw-Hill Publishing Company, Oct 1991.
6. S Narayanan & T K Manicavachogam Pillay, Differential Equations.: S V
7. Publishers Private Ltd., 1981.
8. I N Sneddon, Elements of Partial Differential Equations, 3rd ed.: Mc.GrawHill., 1980.

8SMAT8T: Mathematics Paper – 8	
Total Teaching Hours : 52	No. Of Lecture Hours/Week: 04
Max Marks: 70	Credits : 4
Course Outcome:	
<ul style="list-style-type: none"> The students are introduced to the concepts of Complex Analysis such as Analytic Functions, Bi – Linear transformation and Conformal Mappings. The paper also provides concepts on Computational Numerical Methods to solve Algebraic and Transcendental Equations along with Methods to solve ODEs. 	
UNIT 1: ANALYSIS III	Teaching Hours :12
<p>Complex Analysis: Complex numbers – Cartesian and polar form – geometrical representation – complex – Plane – Euler’s formula. Functions of a complex variable – limit, continuity and differentiability of complex function. Analytical function and its properties. Riemann equations in Cartesian and Polar forms – Sufficiency conditions for analyticity (Cartesian form only) – Harmonic function – standard properties of analytic functions – construction of analytic function when real or imaginary part is given – Milne Thomson method. Complex integration – the complex integration – properties – problems. Cauchy’s Integral theorem – proof using Green’s theorem – direct consequences. Cauchy’s Integral formula with proof – Cauchy’s generalized formula for the derivatives with proof, applications for evaluation of simple line integrals – Cauchy’s inequality with proof – Liouville’s theorem with proof. Fundamental theorem of algebra with proof.</p> <p>Transformations – conformal transformation – some elementary transformations namely Translation, rotation, magnification and inversion – examples.</p> <p>The bilinear transformation (B.T.) – cross ratio – invariant points of a B.T. – properties –</p> <p>(i) B.T. sets up a one-to-one correspondence between the extended z-plane and the extended w-plane.</p> <p>(ii) Preservation of cross ratio under a B.T.</p> <p>(iii) B.T. transforms circles onto circles or straight lines.</p> <p>Problems on finding a B.T. and finding images under a B.T. and invariant points of B.T. Discussion of transformations for standard functions.</p>	

UNIT 2: NUMERICAL METHODS II	Teaching Hours :12
<p>Numerical solutions of algebraic and Transcendental equations, Bisection method - method of false position – Newton-Raphson method. Numerical solutions of non-Homogeneous system of linear algebraic equations in three variables by Jacobi's method and Gauss-Seidel method. Computation of largest Eigen value of a square matrix by power method.</p> <p>Solutions of initial value problems for ordinary linear first order differential equations by Taylor's series, Euler's and Euler's modified method and Runge – Kutta 4th order.</p>	
<i>Essential Text Book:</i>	
<ol style="list-style-type: none"> 1. S Shanthinarayan, Complex Analysis, S Chand Co. Pvt. Ltd., 2012. 2. M K Jain, S R K Iyengar, and R K Jain, Numerical Methods for Scientific and Engineering Computation, 4th ed. New Delhi, India: New Age International, 2012. 3. www.scilab.org 4. wxmaxima.sourceforge.net 5. www.geogebra.org 	
<i>Reference Text Books:</i>	
<ol style="list-style-type: none"> 1. R V Churchill & J W Brown, Complex Variables and Applications, 5th ed.:McGraw Hill Companies., 1989. 2. L V Ahlfors, Complex Analysis, 3rd ed.: Mc Graw Hill, 1979. 3. A R Vashista, Complex Analysis, Krishna Prakashana Mandir, 2012. 4. S S Sastry, Introductory methods of Numerical Analysis, Prentice Hall of India, 2012. 	

1BCAMAT Discrete Mathematics – Mathematics I		
Total Teaching Hours : 52	No. Of Lecture Hours/Week: 04	
Max Marks: 70	Credits : 4	
Course Outcome:		
<ul style="list-style-type: none"> • The students are introduced to the concepts of Set Theory, Relations and Functions, topics on Permutations and combinations, Binomial Theorem. • The paper also provides concepts on Fundamentals of Mathematical Logic. • The Matrices topic is introduced with subtopics Inverse of a matrix and Cayley Hamilton Theorem. 		
UNIT 1 : SET THEORY		Teaching Hours :08
The student learns to express the whole given data in the form of Venn Diagram. Different types of Sets , Union and Intersection ,Difference of two sets and finding the number of elements in a set is known.		
UNIT 2 : RELATIONS AND FUNCTIONS		Teaching Hours :12
By learning the cartesian product the candidate can learn how to form different relations and for the given Relation how to find the ordered pairs		
UNIT 3: FUNDAMENTAL PRINCIPLES OF COUNTING		Teaching Hours 07
Arrangement of objects and selection of things can be known, expansion of two terms is learnt very easily by using Binomial theorem. Expansion of two terms with nth power or more also can be expanded.		
UNIT 4: FUNDAMENTALS OF LOGIC		Teaching Hours :15
Truth tables of conjunction and Disjunction are known which is used in circuits, logical implication, use of Quantifiers is known.		
UNIT 5: MATRICES		Teaching Hours :10
Large amount of data can be arranged in matrix form can be learnt. To find the unknowns in equations can be solved through matrix method. Simultaneous linear equations can be solved in less duration.		

Essential Text Book:

1. Ralph.P.Grimaldi, Discrete and combinatorial Mathematics, An applied introduction, Pearson Education (LPE) Fourth edition, sixth Indian Reprint, 2004..
2. Kolman, Busby and Ross, Discrete Mathematical, 5/e, Pearson Education 2003.
3. Mali, DS and SEN, M.K., Discrete Mathematical Structures (Theory and Applications) Thomas Pub.2006.
4. Srimani P.K. Discrete Mathematical Structures, Cambridge University. Press.2006.

Reference Text Books:

1. Garry Haggard, John Schlips, SUE Whiterides, Discrete Mathematics for Computer Science, Thompson Pub. 2006
2. Thomas Koshy, Discrete Mathematical Structures, Elseiver, 2006.
3. Richard Johnsonbaugh, Discrete Mathematics, Fifth edition, Pearson Education (LPE) 2003.
4. Rajendra Akerkar and Rupali Akerkar, Discrete Mathematics, Pearson Education, 2004
5. C.L.Liu, Elements of Discrete Mathematics, McGraw Hill, 1985.

2BCAMAT Statistical Mathematics – Mathematics II	
Total Teaching Hours: 54	No. Of Lecture Hours/Week: 04
Max Marks: 70	Credits: 4
Course Outcome:	
<ul style="list-style-type: none"> • The students are introduced to the concepts of Numerical Methods such as Interpolation methods, Iterative methods, Elimination methods. • The paper also provides to solve system of linear equations, Ordinary Differential Equations, IVP and BVP. • Basic concepts of finding the Mean, Median, Mode, Probability axioms based on set theory concepts. 	
UNIT 1: ROOTS OF EQUATIONS	Teaching Hours :08
Different methods such as Bisection methods and Newtons method are learnt to solve the system of non-linear equations. Along with this convergence analysis, failure of Newtons method due to bad starting points, Modification of Newtons method for multiple roots.	
UNIT 2: INTERPOLATION AND NUMERICAL DIFFERENTIATION	Teaching Hours :08
Through Interpolations the missing data can be found accurately with the given data and from Extrapolation the successive data or outside the given range is analysed.	
UNIT 3: NUMERICAL INTEGRATION	Teaching Hours: 06
Integration problems are solved without using integration formulae. Problems are solved using three methods. Trapezoidal rule, simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule.	
UNIT 4: SYSTEM OF LINEAR EQUATIONS	Teaching Hours: 08
Linear equations are solved by Iterative methods where the unknowns can be found accurately.	
UNIT 5: ORDINARY DIFFERENTIAL EQUATIONS	Teaching Hours: 08
B.V.P are solved for linear differential equations. The values which are asked can be solved using the given initial values by applying few iterative methods.	

UNIT 6: STATISTICAL METHODS	Teaching Hours:10
Mean, Median, Mode, rank, skewness, Karl Pearson correlation methods are used in this chapter.	
UNIT 7: PROBABILITY	Teaching Hours: 06
Laws of Probability, Bayes theorem, applications of probability are learnt.	
Text Book	
Chenay E.W and Kincaid D.R. “Numerical Methods and Applications”, Indian edition 2008.	
<i>Reference Text Books:</i>	
<ol style="list-style-type: none"> 1. Jain M.K. Iyengar, S.R.K and Jain R.K. “Numerical Methods for Scientific and Engineering Computation”. 2. Shastry S.S – “Introductory Methods of Numerical Analysis” , PHI(2005) 3. J. Medhi “Statistical Methods” , New age Publications 1992. 4. Ronald E Walpole and Raymond H Meyers : Probability and Statistics for Engineers and Scientists (Second Edition) 5. Srimani P.K and Vinayaka Murthy M, text book of probability and Statistics, Subash Publications 2000. 	

1BCBMAT Business Mathematics	
Total Teaching Hours: 56	No. Of Lecture Hours/Week: 04
Max Marks: 70	Credits: 4
Course Outcome:	
<ul style="list-style-type: none"> The students are introduced to the concepts of Basic concepts in mathematics like Number system, Theory of Equations. The paper also provides concepts on Matrices, Progressions and Commercial Arithmetic. 	
UNIT 1: NUMBER SYSTEM	Teaching Hours :06
Introduction- Natural Numbers- Even and odd numbers- Integers-Prime numbers- Rational and Irrational numbers- Real numbers- HCF & LCM (simple problems)	
UNIT 2: FUNCTIONS, MODULES & STRINGS	Teaching Hours :10
Introduction – Meaning – Types of equations – Simple/Linear equations and Simultaneous equations (only two variables) Eliminations and Substitution methods only. Quadratic equation – Factorization and Formula Method ($ax^2 + bx + c = 0$) form only. Problems on Commercial applications.	
UNIT 3: MATRICES AND DETERMINANTS	Teaching Hours 14
Meaning and types of Matrices-Operations of Addition , Subtraction, Multiplication of two Matrices- Transpose of a matrix, Determinants- minor of an element- Co-factors of an element- Inverse – Crammers rule in two variables- applications oriented problems.	
UNIT 4: COMMERCIAL ARITHMETIC	Teaching Hours :16
Simple Interest, Compound Interest including half yearly and quarterly calculations, Annuities, Percentages, Bill Discounting, Ratio and Proportions, Duplicate-Triplicate and sub-duplicate of a ratio. Proportions: Third, Fourth and inverse proportions- Problems.	
UNIT 5: PROGRESSIONS	Teaching Hours :10
Arithmetic progression- Finding the nth term of an AP and also sum to first n terms of an AP. Insertion of Arithmetic means, Geometric progression- Finding nth term of GP and also sum to first n terms of GP. Insertion of Geometric Mean- Problems.	

Reference Text Books:

1. Saha: Mathematics for Cost Accounts, Central Publishers
2. R. G. Saha & Others: Methods and Techniques for Business Decisions, VBH
3. Zamarudeen: Business Mathematics, Vikas
4. R.S. Bharadwaj: Mathematics for Economics and Business
5. Madappa, Mahadi Hassan, M.Iqbal Taiyab- Business Mathematics, Subhash
6. G. R. Veena and Seema: Business Mathematics & Statistics, LK Intl Publishers.

2BCBSTA Business Statistics	
Total Teaching Hours : 56	No. Of Lecture Hours/Week: 04
Max Marks: 70	Credits : 4
Course Outcome:	
<ul style="list-style-type: none"> The students are introduced to the concepts of Basic concepts in Statistics, classification and tabulation of data. The paper also provides concepts on Central tendency, dispersion and skewness with brief description of sub topics. 	
UNIT 1: INTRODUCTION TO STATISTICS	Teaching Hours :06
Meaning and Definition – Functions – Scope – Limitations.	
UNIT 2: CLASSIFICATION AND TABULATION OF DATA	Teaching Hours :10
Collection of data – census and sample techniques. Classification of data, preparation of frequency distribution and tabulation data.	
UNIT 3: MEASURE OF CENTRAL TENDENCY	Teaching Hours 14
Meaning and Definition Types of averages- Arithmetic Mean (Simple and Weighted), Median, Mode (Excluding missing frequency problems). Graphical representation of median and mode – Ogive - curve, histogram, smoothed frequency curve and frequency polygon.	
UNIT 4: MEASURE OF DISPERSION AND SKEWNESS	Teaching Hours :10
Meaning and Definition- Range, Quartile Deviation, Mean Deviation, Standard Deviation and Coefficient of Variation. Skewness- Meaning, uses, and problems on Karl Pearson's Coefficient of skewness.	
UNIT 5: INDEX NUMBERS	Teaching Hours :14
Meaning and Definition – Uses – Classification – Construction of Index Numbers – Methods of constructing Index numbers – Simple Aggregative Method – Simple Average of price Relative Method – Weighted Index Method – Fisher's Ideal Method(including TRT and FRT) – Consumer Price Index – Problems.	
<i>Reference Text Books:</i>	
<ol style="list-style-type: none"> Anand Sharma : Statistics For Management, HPH S P Gupta: Statistical Methods – Sultan Chand, Delhi 	

3. D P Apte : Statistical Tools For Managers.
4. S C Gupta : Business Statistics, HPH
5. Dr. B N Gupta : Statistics(Sahitya Bhavan), Agra.
6. N V R Naidu : Operation Research I.K International Publishers.
7. Ellahance : Statistical Methods, Kitab Mehel.
8. Sanhethi and Kapoor : Business mathematics, sultan Chand
9. Veerachamy : Operation Research I K International Publisher
10. S Jayashankar : Quantitative Techniques for Management.