



**JECRC**<sup>TM</sup>  
**UNIVERSITY**  
BUILD YOUR WORLD

**Department of Mathematics**  
**Course Structure and Syllabi**  
**B. Sc. (Minor) Courses**

**Session 2015-16**

## MATHEMATICS

<b>Semester I</b>		
<b>Course Code</b>	<b>Paper</b>	<b>Credits</b>
<b>BMA019A</b>	Numerical Analysis and Algebra	4
<b>BMA020A</b>	Mathematics Lab-1	2
	<b>Total</b>	<b>6</b>
<b>Semester II</b>		
<b>BMA021A</b>	Calculus	4
<b>BMA022A</b>	Mathematics Lab-II	2
	<b>Total</b>	<b>6</b>
<b>Semester III</b>		
<b>BMA023A</b>	Linear Programming	4
<b>BMA024A</b>	Mathematics Lab-III	2
	<b>Total</b>	<b>6</b>
<b>Semester IV</b>		
<b>BMA025A</b>	Differential Equations	4
<b>BMA026A</b>	Mathematics Lab-IV	2
	<b>Total</b>	<b>6</b>
<b>Semester -V</b>		
<b>BMA027A</b>	Analysis	4
<b>BMA028A</b>	Mathematics Lab-V	2
	<b>Total</b>	<b>6</b>
<b>Semester -VI</b>		
<b>BMA029A</b>	Linear Algebra	4
<b>BMA030A</b>	Mathematics Lab-VI	2
	<b>Total</b>	<b>6</b>

## Semester-I

**BMA019A: Numerical Analysis and Algebra**

**Credit(s) : 04**

### **Numerical Analysis**

Numerical solutions of algebraic equations, Interpolation, Numerical differentiation. Numerical Integration, System of linear equations. Eigen value computation. Numerical solution to ordinary differential equations of first order.

### **Algebra :**

Definition of a group with examples and simple properties, Subgroups, Generation of groups, Cyclic groups, Coset, Lagrange's theorem. Homomorphism and Isomorphism. Permutation groups and Cayley's theorem. Normal subgroups, Quotient group, Fundamental theorem of Homomorphism. The Isomorphism theorems for groups.

### ***Suggested Books***

1. M.K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, 1999.
2. C.F. Gerald, P.O. Wheatley, Applied Numerical Analysis, Addison-Wesley, 1998.
3. S. D. Conte, C de Boor, Elementary Numerical Analysis, McGraw-Hill, 1980.
4. C.E. Froberg, Introduction to Numerical Analysis, (Second Edition), Addison-Wesley, 1979.
5. Melvin J. Maron, Numerical Analysis A Practical Approach, Macmillan Publishing Co. Inc. New York, 1982.
6. I.N. Herstein, Topics in Algebra, Wiley Eastern Ltd. New Delhi, 1975.
7. D.T. Finkbeiner, Introduction to Matrices and Linear transformations, CBS Publishers, New Delhi, 1986.
8. K.B. Datta, Matrix and Linear Algebra, PHI Pvt. Ltd. New Delhi, 2000.
9. P.B. Bhattacharya, S.K.Jain, S.R. Nagpal, First Course in Linear Algebra, Wiley Eastern Ltd. New Delhi, 1983.
10. S. Singh, Modern Algebra, Vikas Publ. House, India.

**BMA020A: Mathematics Lab-I****Credit(s) : 2**

Exercises Based on MatLab and Mathematica

***Suggested Books***

1. MATLAB (An Introduction with Application): Amos Gilat, Wiley India.
2. Getting Started with MATLAB: Rudra Pratap, Oxford University Press.
3. A Concise Introduction to MATLAB: William J. Palm III, Tata McGraw Hill Education Private Limited.

**Semester –II****BMA021A: Calculus****Credit(s): 4**

Asymptotes in Cartesian coordinates, intersection of curve and its asymptotes, asymptotes in polar coordinates, Curvature, radius of curvature for Cartesian curves, parametric curves, polar curves, Newton's method, Radius of curvature for pedal curves, Tangential polar equations, Centre of curvature, Circle of curvature, Chord of curvature, evolutes. Tests for concavity and convexity, Points of inflexion, curve tracing.

Functions of Two Variables: Limit, Continuity, Differentiability. Partial differentiation, Change of variables, Euler's, Taylor's theorem, Maxima and minima. Double and triple integrals, Change of order in double integrals, Beta and Gamma functions.

Vector Calculus: Gradient, Divergence and Curl. Greens, Stokes and Gauss Theorems with applications.

***Suggested Books***

1. Introduction to Calculus and Analysis, Volume I, by Richard Courant and Fritz John (Springer)
2. Pratiksha Saxena, Differential Calculus, McGraw-Hill Education India Pvt.Ltd, 2014.
3. Shanti Narayan, P. K. Mittal, Differential Calculus, S. Chand Publisher, Reprint Edition 2006.
4. Smith Bradley, Calculus, Prentice Hall, 1998.
5. Piskunov, Differential And Integral Calculus (Volume -1) 3rd Edition G. K. Publications Pvt. Ltd, 2012.
6. Shanti Narayan, P K Mittal, Vector Calculus, S.Chand Publishing, 4th Edition Revised edition, 1955.
7. Matthews, Paul C., Vector Calculus, Springer-Verlag London, 1998.

**BMA022A: Mathematics Lab-II****Credit(s) : 02**

Following topics given below will be taken up using Matlab and Mathematica Softwares.

1. Numerical integration
2. Finding Area and Volume using Integration
3. Differentiation and Integration of Vector point functions.
4. 2-D and 3-D graphics.( Spheres,Cone,Cylinder)

(MATLAB- High performance numeric computation and visualization software.

MATHEMATICA- Stephen Wolfram.)

***Suggested Books***

1. MATLAB (An Introduction with Application): Amos Gilat, Wiley India.
2. Getting Started with MATLAB: Rudra Pratap, Oxford University Press.
3. A Concise Introduction to MATLAB: William J. Palm III, Tata McGraw Hill Education Private Limited.

### Semester –III

#### **BMA023A: Linear Programming Problem and operation Research**

**Credits : 4**

Linear Programming problem formulation, concave and convex sets, Graphical method. Simplex and Revised Simplex algorithm. Duality theory, Dual simplex method, Transportation, Assignment and Traveling Salesman problems.

#### ***Suggested Books***

1. G. Hadley, Linear Programming, Narosa Publishing House, 1995.
2. S.I. Gass, Linear Programming: Methods and Applications (4th edition) McGraw-Hill, New York, 1975.
3. Kanti Swaroop, P.K. Gupta and Man Mohan, Operations Research, Sultan Chand & Sons, New Delhi, 1998.
4. Hamdy A. Taha, Operations Research, Prentice-Hall of India, 1997.
5. S. I. Gass, Linear Programming : Method and Application.
6. G. Hadley, Linear Programming.
7. S. Vajda, An Introduction to Linear Programming & Theory of Games.

#### **BMA024A: Mathematics Lab-II**

**Credit(s) : 2**

Following topics will be taken up using Matlab and Mathematica Softwares.

MATLAB- High performance numeric computation and visualization software.

MATHEMATICA- Stephen Wolfram.

#### ***Suggested Books***

1. MATLAB (An Introduction with Application): Amos Gilat, Wiley India.
2. Getting Started with MATLAB: Rudra Pratap, Oxford University Press.
3. A Concise Introduction to MATLAB: William J. Palm III, Tata McGraw Hill Education Private Limited.

## Semester –IV

### **BMA025A: Differential Equations**

**Credits : 4**

Ordinary differential equations of first order: initial and boundary conditions, homogeneous equations, linear equations, Exact differential Equation. First order higher degree equations solvable for  $x$ ,  $y$ ,  $p$ , Singular solution. Linear differential equations with constant coefficients, homogeneous linear differential equations, linear differential equations of second order with variable coefficients.

Linear partial differential equations of first order. Non linear PDE of first order: Charpit's method.

Linear partial differential equation of second and higher order of homogeneous and non homogeneous forms with constant coefficients. Second order PDE with variable coefficients. Monge's method. Solution of heat and wave equations in one and two dimensions by method of separation of variables.

### ***Suggested Books***

1. Gorakh Prasad, Integral Calculus, Pothishala Private Ltd. Allahabad.
2. S. Balachandra Rao & H.R. Anuradha, Differential Equations with Applications and Programmes, University Press, Hyderabad, 1996.
3. R.S. Senger, Ordinary Differential Equations with Integration, Prayal Publ. 2000.
4. D.A. Murray, Introductory Course in Differential Equations, Orient Longman (India), 1967.
5. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Son Inc., New York, 1999.
6. Ian N. Sneddon, Elements of Partial Differential Equations, McGraw-Hill Book Company, 1988.
7. S.B. Rao and H.R. Anuradha, Differential Equations, University Press, 1996.
8. W.T.H. Piaggio, Elementary Treatise on Differential Equations and their applications, CBS Publishers N.Delhi, 1985.

### **BMA026A: Mathematics Lab-IV**

**Credits: 2**

Project:

Following topics given below will be taken up using Matlab and Mathematical Softwares.

1. Centre of gravity by integration: C.G of plane area, arc, surface and solid of revolution.
2. Solving Differential Equations obtained in planetary motions and Simple Harmonic Motions.

## Semester V

### **BMA027A: Analysis**

**Credits : 4**

Riemann Integral, Integrability of continuous and monotonic functions, Fundamental theorems of integral calculus, Mean Value theorems of integral calculus.

Improper integrals and their convergence. Comparison test, Abel's and Dirichlet's test, Integral as a function of a parameter and its applications.

Sequences, Theorems on limits of sequences, Monotone convergence theorem, Cauchy's convergence criterion. Infinite series, series of non-negative terms. Comparison test, Ratio test, Rabbe's, logarithmic, De Morgan and Bertrand's tests. Alternating series, Leibnitz's theorem.

**Complex Analysis:** Analytic functions, Harmonic functions, Elementary functions. Mapping by elementary functions, Mobius transformations, Conformal mappings.

Complex integration, Singularity, poles and residue, contour integration.

### ***Suggested Books***

1. Shanti Narayan, A Course of Mathematical Analysis. S. Chand & Co. New Delhi.
2. T. M. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
3. R.R. Goldberg, Real Analysis, Oxford & IBH Publishing Co., New Delhi, 1970.
4. S. Lang, Undergraduate Analysis, Springer-Verlag, New York, 1983.
5. P.K. Jain and S.K. Kaushik, An Introduction to Real Analysis, S. Chand & Co., New Delhi, 2000.
6. Shanti Narayan, Theory of Functions of a Complex Variable, S. Chand & Co. New Delhi.
7. E. T. Copson, Metric Spaces, Cambridge University Press, 1968.
8. R.V. Churchill & J.W. Brown, Complex Variables and Applications, 5<sup>th</sup> Edition, McGraw-Hill, New York, 1990.



**BMA028A: Mathematics Lab-V****Credit(s): 2**

Following topics given below will be taken up using Matlab and Mathematica Softwares.

1. Numerical differentiation
- 2 Numerical Itegration
3. Solving simultaneous equations of more than three variables

***Suggested Books***

1. MATLAB (An Introduction with Application): Amos Gilat, Wiley India.
2. Getting Started with MATLAB: Rudra Pratap, Oxford University Press.
3. A Concise Introduction to MATLAB: William J. Palm III, Tata McGraw Hill Education Private Limited.

**Semester –VI****BMA029A: Linear Algebra****Credit(s): 4**

Vector spaces, subspaces and linear spans, linear dependence and independence. Finite dimensional vector spaces. Linear transformations and their matrix representations. Algebra of linear transformations, the rank and nullity theorem. Change of basis. Dual spaces, bi dual space and natural isomorphism. Eigen values and eigen vectors of LT. Diagonalization, Cayley Hamilton theorem.

Inner product spaces, Cauchy-Schwarz inequality, orthogonal vectors. Orthonormal basis, Bessel's inequality, Gram-Schmidt orthogonalization process.

***Suggested Books***

1. N. Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.
2. K. Hoffman and R. Kunze, Linear Algebra, 2<sup>nd</sup> edition, Prentice-Hall of India, New Delhi, 1971.
3. N. Jacobson, Basic Algebra, Vols I & II, W.H. Freeman, 1980 (also published by Hindustan Publishing Company).
4. K.B. Dutta, Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd, New Delhi, 2000.
5. I.S. Luther and I.B.S. Passi, Algebra, Vol. I - Groups, Narosa Publishing House, Vol. I 1996.

**BMA030A: Mathematics Lab-VI****Credit(s): 2**

Following topics given below will be taken up using Matlab and Mathematical Softwares.

1. Complex Plane: Complex curves and Region in Complex plane
- 2 Complex Integration
3. Singularities, Poles and Residues

***Suggested Books:***

1. MATLAB (An Introduction with Application): Amos Gilat, Wiley India.
2. Getting Started with MATLAB: Rudra Pratap, Oxford University Press.
3. A Concise Introduction to MATLAB: William J. Palm III, Tata McGraw Hill Education Private Limited.