

Faculty of Science, JECRC University
B.Sc. Major in Mathematics

B.Sc. Major Mathematics 2017-20 Scheme

Total credits for the batch is 153

1. **Minimum credit required = Credits**
2. **Total relaxation = Credits**
3. **No relaxation in core and foundation papers**
4. **Option can be availed in specialization, interdisciplinary and general subjects.**

Summary Sheet

Semester	1st	2nd	3rd	4th	5th	6th	Total
Credits	27	24	24	26	26	26	153

Type	Total Credit
Foundation	
Core	
Specialization	
Interdisciplinary	
General	



**JECRC UNIVERSITY
SCHOOL OF SCIENCES
SESSION 2017-20**

Details of various subjects and their credits with contact hours are given below:

Semester I

S. No.	Subject Code	Subject	Lecture (Hr.)	Tutorials (Hrs.)	Practical (Hrs.)	Credits			Total Credits	Paper Type
						L	T	P		
1.	BMA001	Discrete and Combinatorics Mathematics	4	1	-	4	1		5	ID
2.	BMA002	Differential Calculus	4	1	-	4	1		5	F
3.		Core 2 Minor	4	-	2	4		1	5	
4.		Core 3 Minor	4	-	2	4		1	5	
5.		Computer Applications	2	-	2	2		1	3	G
6.		Environment Studies	3	-	1				4	C
									27	

Semester II

S. No.	Subject Code	Subject	Lecture (Hr.)	Tutorials (Hrs.)	Practical (Hrs.)	Credits			Total Credits	Paper Type
						L	T	P		
1.	BMA003B	Integral Calculus	4	-	-	4			4	F
2.	BMA004B	Mechanics	4	1	-	4	1		5	ID
3.	BMA005B	MATLAB I	-	-	2			1	1	
4.		Core 2 Minor	4	-	2	4		1	5	
5.		Core 3 Minor	4	-	2	4		1	5	
6.		Computer Applications	-	-	2			1	1	G
7.		Communication Skills	3	-	-	3			3	F
									24	



Semester III

S. No	Subject Code	Subject	Lecture (Hr.)	Tutorial (Hrs.)	Practical (Hrs.)	Credits			Total Credits	Paper Type
						L	T	P		
1.	BMA006B	Real Analysis	4	-	-	4	1		5	C
2.	BMA007B	Vector Calculus and 3D Geometry	4	-	-	4			4	F
3.	BMA008B	MATLAB II	-	-	2			1	1	
4.		Core 2 Minor	4	-	2	4		1	5	
5.		Core 3 Minor	4	-	2	4		1	5	
6.		Computer Applications	-	-	2			1	1	G
7.		Communication Skills	3	-	-	3			3	F
									24	

Semester IV

S. No	Subject Code	Subject	Lecture (Hr.)	Tutorial (Hrs.)	Practical (Hrs.)	Credits			Total Credits	Paper Type
						L	T	P		
1.	BMA009	Numerical Analysis	4	1	-	4	1		5	S
2.	BMA010	Ordinary and Partial Differential Equations	4	1	-	4	1		5	S
3.		Core 2 Minor	4	-	2	4		1	5	
4.		Core 3 Minor	4	-	2	4		1	5	
5.		Computer Applications	2	-	2	2		1	3	G
6.		Communication Skills	3	-	-	3			3	F
									26	

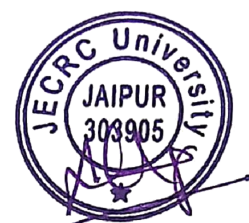


Semester V

S. No	Subject Code	Subject	Lecture (Hr.)	Tutorial (Hrs.)	Practical (Hrs.)	Credits			Total Credits	Paper Type
						L	T	P		
1.	BMA011B	Abstract Algebra	4	-	-	4	1		5	S
2.	BMA012B	Linear Programming	4	-	-	4			4	S
3.	BMA013B	MATLAB III	-	-	2			1	1	
4.		Core 2 Minor	4	-	2	4		1	5	
5.		Core 3 Minor	4	-	2	4		1	5	
6.		Communication Skills	3	-	-	3			3	F
7.		Value Education	3	-	-	3			3	G
									26	

Semester VI

S. No	Subject Code	Subject	Lecture (Hr.)	Tutorial (Hrs.)	Practical (Hrs.)	Credits			Total Credits	Paper Type
						L	T	P		
1.	BMA014B	Complex Analysis	4	1	-	4	1		5	C
2.	BMA015B	Linear Algebra	4	1	-	4	1		5	C
3.		Core 2 Minor	4	-	2	4		1	5	
4.		Core 3 Minor	4	-	2	4		1	5	
5.	BMA016B	Project		-	-				6	C
									26	



B. Sc. (Hons.) MATHEMATICS

Offered By:

Department of Mathematics

Faculty of Science

JECRC University, Jaipur

Semester-wise Distribution of Courses and Credits

Semester –I

S.No.	Course Code	Title	Paper Type	Credits	L	T	P
1.	BMA001B	Discrete and Combinatorial Mathematics	ID	5	4	1	0
2.	BMA002B	Differential Calculus	F	5	4	1	0

Total-10

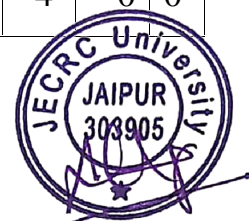
Semester –II

S.No.	Course Code	Title	Paper Type	Credits	L	T	P
1.	BMA003B	Integral Calculus	F	4	4	0	0
2.	BMA004B	Mechanics	ID	5	4	1	0
3.	BMA005B	MATLAB I		1	0	0	1

Total-10

Semester –III

S.No.	Course Code	Title	Paper Type	Credits	L	T	P
1.	BMA006B	Real Analysis	C	5	4	1	0
2.	BMA007B	Vector Calculus and 3D Geometry	F	4	4	0	0



3.	BMA008B	MATLAB II		1	0	0	1
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Total-10

Semester –IV

S.No.	Course Code	Title	Paper Type	Credits	L	T	P
1.	BMA009B	Numerical Analysis	S	5	4	1	0
2.	BMA010B	Ordinary and Partial Differential Equations	S	5	4	1	0

Total-10

Semester –V

S.No.	Course Code	Title	Paper Type	Credits	L	T	P
1.	BMA011B	Abstract Algebra	S	5	4	1	0
2.	BMA012B	Linear Programming	S	4	4	0	0
3.	BMA013B	MATLAB III		1	0	0	1

Total-10

Semester –VI

S.No.	Course Code	Title	Paper Type	Credits	L	T	P
1.	BMA014B	Complex Analysis	C	5	4	1	0
2.	BMA015B	Linear Algebra	C	5	4	1	0
4.	BMA016B	Project	C	6			

Total-16

Grand Total 56

C- Core

F- Foundation

S-Specialization

ID- Interdisciplinary



Semester –I

BMA001B: Discrete and Combinatorial Mathematics

Credits: 5:4+1

UNIT I:

Proposition, Compound Proposition, Conjunction, Disjunction, Implication, Converse, Inverse & Contrapositive, Biconditional Statements, tautology, Contradiction & Contingency, Logical Equivalences, Quantifiers, Arguments, Boolean Algebra, Application of Boolean algebra to switching circuits(using AND, OR and NOT gates).

UNIT II:

Permutations, Combination, Pigeon-hole Principle, inclusion-exclusion principle, derangements, Fundamental theorem of arithmetic.

UNIT III:

Graphs and Planar Graphs: Graph, Multigraph, Weighted Graphs, Directed graphs. Paths and circuits.

UNIT IV:

Matrix representation of graphs. Eulerian Paths and Circuits. Planar graphs.

UNIT V:

Trees and their properties-Trees as graphs-spanning trees-Directed trees-Binary trees-Their traversals-Arithmetic and Boolean expressions as trees- height balanced trees.

Recommended Books:

1. C.L. Liu, Elements of Discrete Mathematics, (Second Edition), McGraw Hill, International Edition, 1986.
2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill Book Co., 199
3. S. Wiitala, Discrete Mathematics: A Unified Approach, McGraw-Hill Book Co.



4. N. Deo, Graph Theory with Applications to Computer Science, Prentice-Hall of India
5. B. Bollobas: Graph Theory (Chapters I - III).
6. P. J. Cameron and J.H. Van Lint: Graphs, codes and designs.
7. Edgar G. Goodaire, Michael M. Parameter, Discrete Mathematics with Graph Theory (3rd Edition), Pearson, 2005.
8. Kenneth H Rosen, Discrete Mathematics and its applications with combinatorics and graph theory by (7th Edition), Tata McGraw-Hill Education private Limited, 2011.

BMA002B: Differential Calculus

Credits: 5:4+1

UNIT I:

Differential Calculus: Successive differentiation and Leibnitz theorem. Limit (\square - \square definition), Continuity, Discontinuity, properties of continuous functions.

UNIT II:

Differentiability, Chain rule of differentiation, Mean value theorems, Taylor's and Maclaurin theorems, Asymptotes in cartesian coordinates, intersection of curve and its asymptotes, asymptotes in polar coordinates.

UNIT III:

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.

UNIT IV:

Multiple points. Cusps and their types, nodes & conjugate points, Tracing of curves in Cartesian, parametric and polar co-ordinates.

UNIT V:

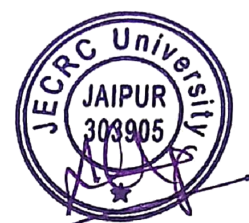


Functions of one variable : limit, continuity, differentiation, Change of variables ,Rolle's Theorem, Mean value theorem. Taylor's theorem. Maxima and minima.

Functions of two real variable: limit, continuity, partial derivatives, differentiability, Partial differentiation,maxima and minima. Method of Lagrange multipliers, Homogeneous functions including Euler's theorem.

Recommended Books:

1. BANSAL , J L; AGARWAL, S M; BHARGAV, S L., Differential Calculus-2
Jaipur JAIPUR PUBLISHING HOUSE, 1988.
2. Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd. Allahabad, 2000.
3. Gorakh Prasad, Integral Calculus, Pothishala Pvt. Ltd. Allahabad, 2000.
4. Gabriel Klambauer, Mathematical Analysis, Marcel Dekkar Inc. New York
1975.
5. Shanti Narayan, Elements of Real Analysis, S. Chand & Company, New Delhi.
6. H. S. Dhami,Differential Calculus – (New Age International)
7. Courant & John, Differential & Integral Calculus (Vols. I & II).
8. N. Piskunov ,Differential & Integral Calculus (Vol. I) – (CBS Publishers &
Distributors)
9. Shanti Naryaan, Differential Calculus – (S. Chand & Co. Ltd.)
10. J. Edwards ,An elementary treatise on the Differential Calculus –
(Radha Publishing House)
11. David V. Widder, Advanced Calculus – (Prentice Hall)



Semester –II

BMA003B: Integral Calculus

Credits: 4

UNIT I:

Integration as the inverse process of differentiation, definite integrals and their properties, Fundamental theorem of integral calculus

UNIT II:

Reduction Formulae: $\sin^n x, \cos^n x, \tan^n x, \sin^m x \cos^n x$ where m, n are positive integers, Double integrals, Change of Variables Cartesian to Polar, change of order of integration.

UNIT III:

Definition and properties of Gamma and Beta functions, Relation between Gamma and Beta functions

UNIT IV:

Rectification: length of Cartesian and polar curves, Calculating surface areas and volumes using double integrals and applications.

UNIT V:

Triple integrals, Calculating volumes using triple integrals and applications, Dirichlet's Integral.

Recommended Books:

1. Gorakh Prasad, A text book on Integral Calculus, Pothishala Pvt .Ltd , Allahabad.
2. Sharma & Jain, Integral Calculus, Galgotia Publication, Dariyaganj, New Delhi.
3. Shanti Narayan, Integral Calculus ,S.Chand and Co., New Delhi.



4. Shanti Narayan, A text book of Vector Calculus, S.Chand and Co. New Delhi
5. Ray and Sharma, Vector algebra & Calculus, Students and Friends Co. Agra
6. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley and sons.
7. Muray R. Spiegel ,Vector Analysis, Schaum Publishing Company , New York.
8. Saran and Nigam , Introduction to Vector Analysis, Pothisala Pvt. Ltd, Allahabad
9. Shanti Narayan & P. K. Mittal, Integral Calculus – (S. Chand & Co. Ltd.)
10. H. S. Dhami, Integral Calculus – (New Age International)
11. B. C. Das & B. N. Mukherjee ,Integral Calculus – (U. N. Dhur)
12. BANSAL, J L; AGARWAL, S M; BHARGAV, S L., Integral Calculus II Jaipur JAIPUR PUBLISHING HOUSE 1991.

BMA004B: Mechanics

Credits: 4+1

Unit 1: Velocity and acceleration along radial and transverse directions, along tangential and normal directions. S.H.M., Hooke's law, motion along horizontal and vertical elastic strings.

Unit 2: Motion in resisting medium—Resistance varies as velocity and square of velocity. Work and Energy. Motion on a smooth curve in a vertical plane. Motion on the inside and outside of a smooth vertical circle.

Unit 3: Central orbits-p-r equations, Apses, Time in an orbit, Kepler's laws of planetary motion.

Unit 4: Moment of inertia of rods, Circular rings, Circular disks, Solid and Hollow spheres, Rectangular lamina, Ellipse and Triangle. Theorem of parallel axis. Product of inertia.

Unit 5: Virtual work, Lagrange's Equation of holonomic system, Hamiltonian equation.

Suggested Books



1. S.L. Loney - An Elementary Treatise on the Dynamics of a Particle and of Rigid Bodies, Kalyani Publishers, New Delhi, 2004.
2. J.L. Synge & B.A. Griffith - Principles of Mechanics, Tata McGraw-Hill, 1959.
3. Ray, M., Dynamics of Rigid Bodies, Students Friends and Co. 1998.
4. Bansal, J.L., Dynamics of a Rigid Body, Jaipur Publishing Co., 2004.

BMA005B: MATLAB I

Credit(s) : 1

Exercises Based on MatLab and Mathematica

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.

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

BMA006B :Real Analysis

Credits: 4+1

UNIT I:

Metric spaces: Introduction. Neighborhood, limit points, interior points, open and closed set, closure and interior, boundary points.

UNIT II:

Subspace of a metric space, Completeness. Cantor's intersection theorem. Dense subsets. Separable metric spaces. Continuous functions. Uniform continuity,

UNIT III:

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

UNIT IV:

Comparison test, Abel's and Dirichlet's test, Integrals as a function of a parameter and its applications, Sequences, Theorems on limits of sequences, Monotone convergence theorem, Cauchy's convergence criterion.

UNIT V:

Infinite series, Comparison test, Ratio test, Raabe's, logarithmic, De Morgan and Bertrand's tests. Alternating series, Leibnitz's test.

Recommended Books:

1. Shanti Narayan, A Course of Mathematical Analysis. S. Chand & Co. New Delhi, 2004.
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.

BMA007B : Vector Calculus and 3D Geometry Credits : 4

UNIT I:

Operations with vectors. Scalar and dot product, Vector differentiation. Directional derivatives, the tangent plane, total differential, gradient, divergence, curl. Line integrals, surface and volume integrals. Green's, Stokes and Gauss theorems and their applications.

UNIT II:

Plane: Definition, Equation of a plane, Angle between two planes, planes through two planes, Distance of a point from a plane, Area of a triangle, Volume of Tetrahedron.

UNIT III:

Straight lines: Introduction, Equations of coordinate axes, Symmetrical form & Non Symmetrical form, Angle between a line and a plane, Perpendicular distance, Intersecting lines, Skew lines, Shortest distance and equation of line of shortest distance, Intersection of three planes.

UNIT IV:

Sphere: Definition, Equation of a sphere, General equation of a sphere, Centre and radius of a sphere, Great circle, Equation of circle, Diameter form of the equation of a sphere, Tangent line and tangent plane of a sphere, Condition of tangency for a line and equation of tangent plane, Angle of intersection of two spheres, Condition of orthogonality of two spheres.

UNIT V:



Cone: Cone, Quadratic Cone, Equation of a cone, Enveloping cone, Condition for general equation of second degree to represent a cone, Intersection with a line, Tangent plane, Reciprocal Cone, Right Circular Cone. **Cylinder:** Definition, Equation of a cylinder, Enveloping cylinder, Equation of enveloping cylinder, Right circular cylinder, Equation of right circular cylinder.

Recommended Books:

1. N.Saran and R.S.Gupta , Analytical Geometry of Three Dimensions , PothisalaPvt.Ltd , Allahabad, 2001.
2. Gorakh Prasad and H.C.Gupta ,Text book on Coordinate Geometry , Pothisala Pvt. Ltd., Allahabad, 2004.
3. Sharma & Jain, Co-ordinate Geometry, Galgotia Publication, Dariyaganj , New Delhi, 1998.
4. P.K.Jain and Khalil Ahmad , A text book of Analytical Geometry of Three Dimensions , Wiley Eastern Ltd, 2008.
5. S.L.Loney, The Elements of Coordinate Geometry , Macmillan and Co., London, 2001.
6. R.J.T.Bell, Elementary Treatise on Coordinate Geometry of Three Dimensions, Macmillan India Ltd, 1998.
7. Bansal J.L., Bhargva S.L., Agarwal S.M., 3-D Coordinate Geometry II, Jaipur *Publishing* House 2004.
8. Susan J. Colley, Vector Calculus (4th Edition) (Featured Titles for Vector Calculus) Pearson; 4 edition (October 8, 2011) (Oct 8, 2011).
9. Susan J. Colley, Vector Calculus (3rd Edition) Pearson; 3 edition (March 26, 2005) (Mar 26, 2005)
10. J N Sharma, Vector Calculus, Krishna Prakashan Media.



BMA008B: MATLAB-II**Credit(s) : 01**

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 –IV

BMA009B:Numerical Analysis

Credits: 5:4+1

UNIT I:

Differences ,Relation between differences and derivatives of polynomials, Factorial notation,Newton's forward and backward interpolation formula (including proof) .Inverse Interpolation

UNIT II:

Divided differences: Newton's and Lagrange's divided differences formulae. Central differences: Gauss's, Stirling's and Bessel's interpolation formulae.Numerical differentiation.

UNIT III:

Numerical integration – Quadrature formula, Trapezoidal rule , Simpson's 1/3 rd and 3/8 th formulae,Gaussian Integration , Newton cotes formula.

UNIT IV:

Numerical solution of algebraic and transcendental equations- Bisection method,Regula-falsi method, Method of iteration and Newton Raphson's Method.Newton's iterative formula for obtaining square and inverse square root.

UNIT V:

Solution of system of linear equations : Gauss elimination method , Jacobi and Gauss Seidal method . Solutions of ordinary differential equations with initial boundary conditions: Picard's method, Euler's and modified Euler's method, Runge'sKutta Method.

Recommended 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), Addition-Wesley, 1979.
5. Melvin J. Maron, Numerical Analysis A Practical Approach, Macmillan Publishing Co. Inc. New York, 1982.
6. Gupta and Malik, Calculus of Finite Differences and Numerical Analysis, , Krishna Prakashan Mandir
7. Gourdin, Boumahrat, Applied Numerical Methods, Prentice Hall of India
8. Melvin J. Maron, Numerical Analysis a Practical Approach, Macmillan Publishing Company, New York
9. H.C. Saxena, Finite Differences & Numerical Analysis, S. Chand & Co. New Delhi
10. Bansal J.L., Bhargava S.L., Numerical Analysis, Jaipur Publishing House, 2004.

BMA010B : Ordinary and Partial Differential Equations Credits: 5:4+1

UNIT I:

Ordinary differential equations of the first order of the form $y' = f(x, y)$: initial and boundary conditions, Bernoulli's equation, exact differential equations, integrating factor, Orthogonal trajectories, Homogeneous differential equations-separable solutions

UNIT II:

Linear differential equations of second and higher order with constant coefficients, First order higher degree equations solvable for x , y , p . Singular solution and envelopes.

UNIT III:

Second order linear differential equations with variable coefficients, homogeneous linear differential equations, method of variation of parameters. Cauchy- Euler equation.

UNIT IV:



Formation of partial differential equations. Types of solutions. PDEs of the first order. Lagrange's solution, Non-linear PDE of first order: Charpit's method.

UNIT V:

Classification of linear partial differential equation of second order, Canonical forms, Cauchy's problem of first and second order partial differential equation. Partial differential equations of first order, Lagrange's solution. Charpit's method.

Recommended 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. E.A. Codington, An Introduction to Ordinary Differential Equations, Prentice Hall of India, 1961.
6. B.Rai, D.P.Choudhary, Ordinary Differential Equations, Narosa Publ. 2004.
7. J.L. Bansal & H.S. Dhami : Differential Equations Vol. I & II, Jaipur House, Jaipur.
8. S. Balachandra Rao & H.R. Anuradha, Differential Equations with Applications and Programmes, University Press, Hyderabad, 1996.
9. Ian N. Sneddon, Elements of Partial Differential Equations, McGraw-Hill Book Company, 1988.



Semester –V

BMA011B: Algebra

Credits: 4+1

UNIT I:

Matrix: Introduction, Elementary operations of matrices. Inverse of a matrix, Rank of a matrix, Symmetric, Skew symmetric, Hermitian, Skew-Hermitian and unitary matrices. Determinants: Definition and properties, application of matrices to the system of linear equations, Consistency of the system of linear equations.

UNIT II:

Algebra: Definition of a group with examples and simple properties, Subgroups, Generator of groups, Cyclic groups, Coset. Lagrange's theorem and its consequences. Homomorphism and Isomorphism. Permutation groups and Cayley's theorem.

UNIT III:

Normal subgroups, Quotient group, Fundamental theorem of Homomorphism. Isomorphism theorems for groups. Automorphism and inner automorphism, Automorphism groups and their computations.

UNIT IV:

Normalizer and centre, Finite groups, Commutator subgroups. Rings, Integral Domains and Fields.

UNIT V:

Ideal and quotient Rings. Ring Homomorphism and basic isomorphism theorems. Prime and maximal ideals.

Recommended Books:

1. I. N. Herstein , Topics in Algebra, Wiley Eastern Ltd. New Delhi, 1975.



2. D.T. Finkbeiner, Introduction to Matrices and Linear transformations, CBS Publishers, New Delhi, 1986.
3. K.B. Datta, Matrix and Linear Algebra, PHI Pvt. Ltd. New Delhi, 2000.
4. P.B. Bhattacharya, S.K. Jain, S.R. Nagpal, First Course in Linear Algebra, Wiley Eastern Ltd. New Delhi, 1983.
5. S. Singh, Modern Algebra, Vikas Publ. House, India.
6. M. Artin: Algebra.
7. S. D. Dummit and M. R. Foote: Abstract Algebra.
8. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal, Basic Abstract Algebra (2nd Edition) Cambridge University Press, Indian Edition, 1977.
9. I. N. Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.
10. Sharma, Gokhroo, Saini, Elements of Abstract Algebra, Jaipur Publishing House, S.M.S. Highway, Jaipur.
11. N. P. Chaudhuri, Abstract Algebra – (Tata Mc.Graw Hill).
12. A. R. Vasishtha, A. K. Vasishtha, Modern Algebra (Abstract Algebra), Krishna Prakashan Media (p) Ltd. 2011.

BMA012B: Linear programming Problem and Operation Research Credits: 4

UNIT I:

Linear Programming problem, formulation, concave and convex sets, Graphical method.

UNIT II:

Simplex and Revised Simplex algorithm.

UNIT III:

Duality theory, Dual simplex method .

UNIT IV:

Transportation, Assignment and Traveling Salesman problems.

UNIT V:

Portfolio Theory, Principle of Optimality and its applications.



Recommended 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. Sharma S. D., Operations Research : Theory, Methods & Applications, KEDAR NATH RAM NATH-MEERUT, 2011.

BMA013B: MATLAB-III

Credit(s): 1

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

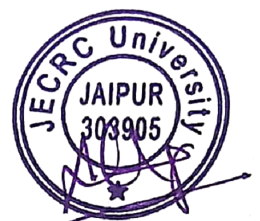
1. Numerical differentiation

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

BMA014B:Complex Analysis

Credits: 5:4+1

UNIT I:

Complex Numbers: Stereographic projection. Functions of a complex variable, mappings, limits, theorems of limits without proof, continuity, derivatives, differentiation formula, Cauchy-Riemann equations, sufficient conditions, Cauchy-Riemann equations in Polar form, analytic functions, and harmonic functions.

UNIT II:

Linear functions, the function $1/Z$, linear fractional transformations, the functions $w = z^n$, $w = \exp(Z)$, special linear fractional transformations.

UNIT III:

Definite integrals, contours, line integrals, Cauchy-Goursat theorem (without proof), Cauchy integral formula, derivatives of analytic functions, maximum moduli of functions.

UNIT IV:

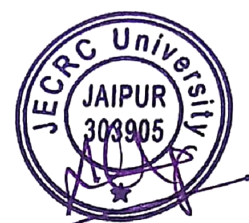
Convergence of sequences and series (theorems without proofs), Taylor's series, Laurent's series, zero's of analytic functions.

UNIT V:

Residues, the residue theorem, the principle part of a function, poles, evaluation of improper real integrals, improper integrals. integrals involving trigonometric functions, definite integrals of trigonometric functions.

Recommended Books:

1. Shanti Narayan, Theory of Functions of a Complex Variable, S. Chand & Co. New Delhi.



2. R.V. Churchill & J.W. Brown, Complex Variables and Applications, 5th Edition, McGraw-Hill, New York, 1990.
3. Mark J. Ablowitz & A.S. Fokas, Complex Variables: Introduction and Applications, Cambridge University Press. South Asian Edition, 1998.
4. Murray R. Spiegel, Theory and Problems of Complex Variables-, Schaum outline series, 2004.

BMA015B: Linear Algebra

Credits: 4+1

UNIT I:

Vector spaces, subspaces and linear spans, linear dependence and independence.

UNIT II:

Finite dimensional vector spaces. Linear transformations and their matrix representations.

UNIT IV:

Algebra of linear transformations, the rank and nullity theorem. Change of basis.

UNIT IV:

Dual spaces, bi dual space and natural isomorphism. Eigen values and eigen vectors of LT. Diagonalization, Cayley Hamilton theorem.

UNIT V:

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

Recommended Books:

1. K. Hoffman and R. Kunze, Linear Algebra, 2nd edition, Prentice-Hall of India, New Delhi, 1971.
2. K.B. Dutta, Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd, New Delhi, 2000.
3. David C. Lay, Linear Algebra and Its Applications, 4th Edition (Jan 20, 2011).
4. Georgi E. Shilov, Linear Algebra (Dover Books on Mathematics) (Jun 1, 1977).
5. Rajul Dutt, A. R. Vasishtha, J.N. Sharma, A. K. Vasishtha, Linear Algebra, Krishna Prakashan Media (p) Ltd., 2011.

BMA016B: Project

Credits: 6



