

# MAULANA AZAD UNIVERSITY, JODHPUR

## B.Sc. MATHEMATICS

CODE	DESCRIPTION	PD/W	EXAM	CIA	ESE	TOTAL
BSMT111	ALGEBRA	3	3 hrs	20	80	100
BSMT112	DIFFERENTIAL CALCULUS	3	3 hrs	20	80	100
BSMT113	CO-ORDINATE GEOMETRY IN 2 DIMENSIONS AND 3-DIMENSIONS	3	3 hrs	20	80	100
BSMT211	DIFFERENTIAL EQUATIONS	3	3 hrs	20	80	100
BSMT212	INTEGRAL AND VECTOR CALCULUS	3	3 hrs	20	80	100
BSMT213	CO-ORDINATE GEOMETRY IN 3- DIMENSIONS	3	3 hrs	20	80	100
BSMT311	PARTIAL DIFFERENTIAL EQUATION AND LAPLACE TRANSFORM	3	3 hrs	20	80	100
BSMT312	NUMERICAL ANALYSIS	3	3 hrs	20	80	100
BSMT313	DYNAMICS OF A PARTICLE	3	3 hrs	20	80	100
BSMT411	OPTIMIZATION TECHNIQUES	3	3 hrs	20	80	100
BSMT412	ABSTRACT ALGEBRA	3	3 hrs	20	80	100
BSMT413	STATICS	3	3 hrs	20	80	100

# MAULANA AZAD UNIVERSITY, JODHPUR

## B.Sc. 1<sup>ST</sup> SEMESTER MATHEMATICS

CODE	DESCRIPTION	PD/W	EXAM	CIA	ESE	TOTAL
BSMT111	ALGEBRA	3	3 hrs	20	80	100
BSMT112	DIFFERENTIAL CALCULUS	3	3 hrs	20	80	100
BSMT113	CO-ORDINATE GEOMETRY IN 2 DIMENSIONS AND 3- DIMENSIONS	3	3 hrs	20	80	100
<b>TOTAL</b>				<b>60</b>	<b>240</b>	<b>300</b>

<b>BSMT111: ALGEBRA</b>	
<b>UNIT-I</b>	<p>Matrix: The characteristic equation of matrix: Eigen Values and Eigen Vectors, Cayley-Hamilton theorem, its use in finding the inverse of a Matrix.</p> <p>Theory of equation: Relation between roots and coefficient of the equation Symmetric function of roots. Solution of cubic equation by Cordon's method and Biquadratic equation by Ferrari's method.</p>
<b>UNIT-II</b>	Relations: Equivalence and partial order relations. Definition of a group with examples and simple properties. Order of an element in a group and its properties.
<b>UNIT-III</b>	Definition and properties of permutation group, cyclic group and sub group.
<b>UNIT-IV</b>	Infinite series: Convergent series, convergence of geometric series, And necessary condition for the convergent series, comparison tests: Cauchy root test.
<b>UNIT-V</b>	D'alembert's Ratio test, logarithmic test, Raabe's test, De' Morgan and Bertrand's test, Cauchy's condensation test, Leibnitz's test of alternative series, absolute convergent.

### Suggested Reading:

1. Algebra: Bansal, Bhargav, Agarwal, Jaipur publishing House
2. Modern Algebra's : Vashista
3. Abstract Algebra; Bansal, Bhargav, Agarwal
4. Gokhroo. Gokhroo: Abstract Algebra (Eng Ed)

# MAULANA AZAD UNIVERSITY, JODHPUR

<b>BSMT112: DIFFERENTIAL CALCULUS</b>	
<b>UNIT-I</b>	Polar Co-ordinates, Angle between radius vector and the tangents. Angle between curves in polar form, length of polar subs tangent and subnormal, pedal equation of a curve, derivatives of an arc.
<b>UNIT-II</b>	Curvature various formula, centre of curvature and chord of curvature and related problems. Partial differentiation, Euler's theorem on homogenous function, chain rule of partial differentiation.
<b>UNIT-III</b>	Maxima and Minima of functions of two variables and of three variables connected by a relation, Lagrange's Method of undetermined multipliers. Asymptotes, determination of asymptotes intersection of curve and its asymptotes.
<b>UNIT-IV</b>	Double point , node, cusp, necessary conditions for existence of double points, classification of double point, nature of double points at origin, curve tracing, procedure for tracing Cartesian curves, parametric equations, polar curve.
<b>UNIT-V</b>	Envelopes: Envelope of family of curve having one parameter and also of two parameters, related by a relation, Evolutes, Mean value theorem. (Statements, Geometrical interpretations and verifications only)

## SUGGESTED READING:

1. Differential calculus II, Bansal. Bhargav and Agarwal (JPH)
2. A Text Book of Differential Calculus II, Gokhroo, Saini
3. Gupta, Juneja and Tandon (English Ed)

# MAULANA AZAD UNIVERSITY, JODHPUR

<b>BSMT113: CO-ORDINATE GEOMETRY IN 2 DIMENSIONS AND 3 DIMENSIONS</b>	
<b>UNIT-I</b>	Ellipse: Standard equation, Tangent, Normal, Chord of contact, Pole Polar and their properties, Diameter and conjugate diameters. Hyperbola: standard equation, Tangent, Normal, Pole and Polar, Asymptotes, Rectangular Hyperbola, auxiliary circle, director circle.
<b>UNIT-II</b>	General equation of second degree, Nature of conic, tracing of conics.
<b>UNIT-III</b>	Polar equations, Polar equations of a conic, polar equation of tangents, perpendicular lines and normal, director circle of conic and related simple problems.
<b>UNIT-IV</b>	3-D: Sphere: Definition of sphere, equation of sphere in various form i.e. General form, simple form, Plane section of the sphere, Great circle, sphere through given circle, diameter form of the equation of the sphere, power of a point, Tangent line & Tangent line of sphere, pole and polar plane, properties of poles and polars.
<b>UNIT-V</b>	Cone: Definition of cone, equation of cone, enveloping cone condition of tangency, reciprocal cone and right circular cone. Cylinder: definition of cylinder, enveloping cylinder, equation of enveloping cylinder, right circular cylinder.

## **SUGGESTED READINGS:**

1. 2-D Co-ordinate Geometry A. Bansal and Bhargav B. Gokhroo and Saini & Ojha
2. Co-ordinate geometry, Sharma and Varshney

# MAULANA AZAD UNIVERSITY, JODHPUR

## B.Sc. II<sup>ND</sup> SEMESTER

CODE	DESCRIPTION	PD/W	EXAM	CIA	ESE	TOTAL
BSMT211	DIFFERENTIAL EQUATIONS	3	3 hrs	20	80	100
BSMT212	INTEGRAL AND VECTOR CALCULUS	3	3 hrs	20	80	100
BSMT213	CO-ORDINATE GEOMETRY IN 3- DIMENSIONS	3	3 hrs	20	80	100
<b>Total</b>				<b>60</b>	<b>240</b>	<b>300</b>

<b>BSMT211: DIFFERENTIAL EQUATIONS</b>	
<b>UNIT-I</b>	Degree and order of a differential equation, equation of first order and first degree. Equation in which the variables are separable, Homogeneous equations, linear equations. Differential equations reducible to linear equations, exact differential equations and reducible to exact differential equations.
<b>UNIT-II</b>	First order and higher degree differential equations solvable for x, y, p. Clairaut's form and singular solutions, linear differential equation with constant coefficients
<b>UNIT-III</b>	Homogeneous linear differential equation with variable coefficients and the equation reducible to homogeneous form. Total differential equation of the form $Pdx+Qdy+Rdz=0$ by the method of inspection and method of homogeneous equation.
<b>UNIT-IV</b>	Simultaneous differential equations and also of the type $dx/P=dy/Q=dz/R$ , exact differential equations of higher order and the differential equations reducible to exact form.
<b>UNIT-V</b>	Second order linear differential equations: Normal form, solution of equations when one part of C.F. is known change of independent variables, Variation of parameters.

### SUGGESTED READINGS:

1. Differential Equation, A. Bansal, Bhargava and Agarwal B. Gokhroo, Saini and Bhati
2. Differential Equation, Bansal and Dhama

# MAULANA AZAD UNIVERSITY, JODHPUR

<b>BSMT212: INTEGRAL CALCULUS AND VECTOR CALCULUS</b>	
<b>UNIT-I</b>	Beeta and gamma functions: properties and problem based on it. Rectification, differentiation under the sign of integration.
<b>UNIT-II</b>	Quadrature, Volume and surface of solid of revolution.
<b>UNIT-III</b>	Evaluation of double and triple integration in Cartesian and polar co-ordinates, Change from Cartesian to polar form, change of order of integration, Dirichlet's integral.
<b>UNIT-IV</b>	Scalar and vector point functions, Vector differentiation, directional derivatives, Gradient, Divergence and curl, identities involving these operators and related problems.
<b>UNIT-V</b>	Vector integration: Gauss divergence theorem, stoke's theorem, Green's theorem (without proof of each theorem) and their applications.

## **SUGGESTED READING:**

1. A Text bok of Integral calculus II (Hindi Ed)
2. Vector calculus, A Bansal, Bhargav and Agarwal B. Gokhroo, Saini and Bhati

# MAULANA AZAD UNIVERSITY, JODHPUR

<b>BSMT213: CO-ORDINATE GEOMETRY IN 3-DIMENSIONS</b>	
<b>UNIT-I</b>	Central conicoid, tangent line and Tangent planes, Nature and shape of ellipsoid, condition of tangency, equation of director sphere, pole and polar plane, Polar lines, equation of polar line, section with a given centre, Enveloping cone, equation of enveloping cone, Asymptotic cone, cone as a central surface.
<b>UNIT-II</b>	Normal to a conicoid, Number of a normal drawn from an external point to the ellipsoid, cubic curve through the feet of six normal's, cone through six normal's, diameter of a conicoid, equation of a Diametral plane, conjugate semi diameter plane, conjugate semi diameters
<b>UNIT-III</b>	Paraboloid, Intersection of a line and a paraboloid, condition of tangency, important standard results, equation of normal's, Normal to a paraboloid from a given point, cubic curve through the feet of normal's, cone through the five normals.
<b>UNIT-IV</b>	Plane section of conicoid, Nature of the plane section of a central conicoid, Axes and area of a central plane of a central conicoids, Axes and area of non-central plane, section of central conicoid, axes & Area of the plane section of a paraboloid, circular section of the conicoid, circular section of ellipsoid, hyperboloid, paraboloid, Umbilics of ellipsoid and paraboloid.
<b>UNIT-V</b>	<b>Generating lines condition for generators of central conicoid, Generating lines of <math>\lambda</math> and <math>\mu</math>-system and its properties, Intersection of generators through two points of principal elliptic section of a hyperboloid of one sheet.</b>

## SUGGESTED READINGS:

1. 2-D Co-ordinate Geometry A. Bansal and Bhargav B. Gokhroo and Saini & Ojha
2. Co-ordinate geometry, Sharma and Varshney

# MAULANA AZAD UNIVERSITY, JODHPUR

## B.Sc. -III<sup>RD</sup> SEMESTER

CODE	DESCRIPTION	PD/W	EXAM	CIA	ESE	TOTAL
BSMT311	PARTIAL DIFFERENTIAL EQUATION AND LAPLACE TRANSFORM	3	3 hrs	20	80	100
BSMT312	NUMERICAL ANALYSIS	3	3 hrs	20	80	100
BSMT313	DYNAMICS OF A PARTICLE	3	3 hrs	20	80	100
<b>TOTAL</b>				60	240	300

### BSMT311- PARTIAL DIFFERENTIAL EQUATION AND LAPLACE TRANSFORM

#### UNIT-I

Partial differential equation: Definition, order and degree, Formation of a PDE by elimination of arbitrary constant and function, solution of Lagrange's equation, Solution of non linear partial differential equation of the form  $f(p,q)=0$  and  $z=px+qy+f(p,q)$  (without using general method).

#### UNIT-II

Solution of non linear partial differential equation of the form  $f(p,q)=0$ ,  $f(z,p,q)=0$  and  $f_1(x,p)=f_2(p,q)$  Charpit's method.

#### UNIT-III

Laplace transform : Definition of Laplace transform, properties of Laplace transform, Linearity properties, shifting property, change of scale property, Laplace transform of integral of the function of the type  $f(t)/t$ , periodic function, Convolution theorem, Laplace transform of derivatives of functions.

#### UNIT-IV

Inverse Laplace transform: Properties of inverse Laplace transform: linear property ,shifting property ,change of scale property, Inverse Laplace transform of derivatives of functions and Inverse Laplace transform of function of the type  $f(p)/p$ .

#### UNIT-V

Application of Laplace transform: Solution of ordinary differential equations with constant and variable coefficients, solution of simultaneous ordinary differential equations.

#### SUGGESTED READINGS:

1. Gokhroo, Saini, Ojha : Partial differential equations.
2. Partial differential equation by M.D.Raishinghamia
3. Laplace and fourier transform by Goyal & gupta



# MAULANA AZAD UNIVERSITY, JODHPUR

## BSMT -312 NUMERICAL ANALYSIS

### UNIT-I

Difference operators and factorial notation, Differences of polynomial, relation between operators  $E$ ,  $\nabla$ , and  $\nabla^2$ , interpolation and extrapolation, forward and backward interpolation, Newton-Gregory forward and backward formulae for interpolations.

### UNIT-II

Interpolation with unequal intervals, Lagrange's interpolation formula, divided differences, properties of divided differences, Newton's divided differences formula for unequal intervals.

### UNIT-III

Central difference interpolation: Sheppard's central difference operators, relation between operators  $E$ ,  $\nabla$ ,  $\nabla^2$ , and  $\nabla^3$ . Gauss's forward, backward and central interpolation formula, Sterling's interpolation formula for central difference, Bessel's interpolation formula.

### UNIT-IV

Numerical differentiation, Numerical integrations by Trapezoidal rule, Simpson's 1/3, 3/8 rule and Weddle's rule.

### UNIT-V

Solution of algebraic and transcendental equations: Bisection method, Regula Falsi method, iterative method and Newton-Raphson method, Fitting of a straight line and parabola.

### SUGGESTED READINGS:

1. Goyal, Mittal : Numerical Analysis, Prograti Prakashan
2. Bansal, Bhargava : Numerical Analysis (Hindi Ed.)
3. Saxena, H.C. : Numerical Analysis
4. Gokhroo : Numerical Analysis (Hindi Ed.)

# MAULANA AZAD UNIVERSITY, JODHPUR

## BSMT-313 DYNAMICS OF A PARTICLE

### **UNIT-I**

Kinematics: Radial and transverse velocities and accelerations. Angular velocity and acceleration, Tangential and normal velocities and acceleration.

### **UNIT-II**

Simple Harmonic motion, Hook's law, Motion of a particle attached to horizontal and vertical elastic strings.

### **UNIT-III**

Motion in a plane under variable forces, Inverse square law of motion, Motion in a resisting medium (resistance varies as a velocity and square of the velocity).

### **UNIT-IV**

Circular and Cycloidal motion of a Particle on smooth and rough vertical plane curve.

### **UNIT-V**

Central orbits , Apse, time in orbit, Kepler's laws of planetary motion.

### **SUGGESTED READINGS:**

1. S.L. Loney : Dynamics of a particle & Rigid bodies.
2. Ray, M : A Text book on Dynamics
3. Gokhroo, Saini & Yadav : Higher Dynamics II (Hindi Ed.).
4. Bhargava, Agarwal : Dynamics (Hindi Ed. )

# MAULANA AZAD UNIVERSITY, JODHPUR

## B.Sc. IV<sup>TH</sup> SEMESTER

CODE	DESCRIPTION	PD/W	EXAM	CIA	ESE	TOTAL
BSMT411	OPTIMIZATION TECHNIQUES	3	3 hrs	20	80	100
BSMT412	ABSTRACT ALGEBRA	3	3 hrs	20	80	100
BSMT413	STATICS	3	3 hrs	20	80	100
<b>TOTAL</b>				60	240	300

### BSMT 411 OPTIMIZATION TECHNIQUES

#### UNIT-I

Introduction to linear programming problems, mathematical formulations, Graphical method of solution of linear programming problems for two variables, Theory of convex sets and their properties.

#### UNIT-II

Initial basic feasible solution, improved BFS , slack and surplus variables, entering and departing elements ,The simplex technique and its application to solve L.P. problems.

#### UNIT-III

Artificial Variables, Big-M and Two Phase method to solve a linear programming problem.

#### UNIT-IV

Dual and primal problems, standard form of a primal, formation of dual of a standard primal, fundamental theorem of duality, solution of a LPP by solving its dual by simplex method.

#### UNIT-V

Assignment and Transportation problems and their optimum solutions.

#### SUGGESTED READINGS:

1. Gokhroo, Saini : Linear Programming (Hindi Ed. )
2. Mittal, Sethi : Linear Programming, Pragati Prakashan
3. Bhargava, Sharma, Bhati : Linear programming (Hindi Ed.)

# MAULANA AZAD UNIVERSITY, JODHPUR

## BSMT412 ABSTRACT ALGEBRA

### UNIT-I

Coset decomposition, index of a subgroup, Lagrange's theorem and its consequences. Fermat's and Euler's theorems.

### UNIT-II

Normal subgroup with properties, simple subgroups, quotient groups, group homomorphism, its kernel and properties, Isomorphism, fundamental theorem of homomorphism.

### UNIT-III

**Rings:** Definition and kinds of rings, integral domain, division ring, sub ring, ring homomorphism and ring isomorphism.

### UNIT-IV

**Field:** Definition and properties, sub field, prime field, imbedding of an integral domain in a field, field of quotients.

### UNIT-V

**Ideals:** Definition and properties, principle ideals and principle ideal ring, prime ideal, maximum ideal, Polynomial over a ring, integral domain and field, Division algorithm.

### SUGGESTED READINGS:

1. Sharma, G.C. : Modern Algebra
2. Bansal & Bhargava : Abstract Algebra (Hindi Ed. )
3. Agarwal, R.S. : Text Book on Modern Algebra
4. Gokhroo & Saini : Abstract Algebra (Hindi Ed. )

# MAULANA AZAD UNIVERSITY, JODHPUR

## BSMT413 STATICS

### **UNIT-I**

Equilibrium of a body under several coplanar forces, Reduction of a system of coplanar forces into a force and a couple, Equation of resultant force, equilibrium of a rigid body under the action of three coplanar forces, equilibrium of a rigid body under the action of more than three coplanar forces.

### **UNIT-II**

Friction: Force of Friction, Kinds of Friction, Angle of Friction, Coefficient of friction, Relation between angle of friction and coefficient of friction, Laws of friction, limiting equilibrium on an inclined plane, least force required to pull a body up or down an inclined rough plane.

### **UNIT-III**

Virtual work: Principle of virtual work for a system of coplanar forces acting on a particle, Principle of virtual work for a number of coplanar forces acting at different points of a rigid body, forces which can be omitted in forming the equation of virtual work, Problems involving elastic strings and curves,

### **UNIT-IV**

Common catenary: Definition and equation of common catenary( Intrinsic, Cartesian), Shape of the common catenary, Approximation of the common catenary.

### **UNIT-V**

Forces in three dimensions, resultant of any given system of forces acting at given points of a rigid body, Moment of a force about a line, equation of central axis, stable and unstable equilibrium, Poinso't's central axis, wrenches.

### **SUGGESTED READINGS:**

1. S.L. Ioney : Statics
2. R.S. Verma : A Text Book on Statics
3. Bhargava, Agarwal, Gupta : Statics (Hindi Ed.)
4. Gokhroo : Statics (Hindi Ed.).