

<b>Sem/Paper No.</b>	<b>Name of the paper</b>	<b>Course</b>	<b>Marks</b>	<b>Lectures</b>
MTMP-101	Classical Algebra & Trigonometry	A. Classical Algebra	30	54
		B. Trigonometry	20	36
MTMP-201	Modern Algebra & Geometry (Two – Dimensions 2-D)	A. Modern Algebra	30	54
		B. Geometry (2-D)	20	36
MTMP-301	Differential Calculus & Integral Calculus	A. Differential Calculus	30	54
		B. Integral Calculus	20	36
MTMP-401	Differential Equations & Vector Analysis	A. Differential Equations	30	54
		B. Vector Analysis	20	36
MTMP-501	Dynamics & Statics	A. Dynamics	30	54
		B. Statics	20	36
MTMP-601	Linear Programming & Solid Geometry (3-D)	A. Linear Programming	30	54
		B. Solid Geometry(3-D)	20	36

**MTMP-101**  
**CLASSICAL ALGEBRA & TRIGONOMETRY**

(To answer one question from each unit. Each unit will have provision for internal choice.)

**GROUP-A**  
**CLASSICAL ALGEBRA**

(Marks –30)

**Unit –I**

**Marks-10**

Adjoint of a square matrix, Jacobi's Theorem; Inverse of a square matrix , Elementary transformation on matrices , Rank of a matrix , Solution of a system of linear equations by matrix inverse and by Gaussian elimination method.

**Unit –II**

**Marks-10**

Relation between the roots and coefficients of a polynomial equations of nth degree with special reference to cubic equations, Symmetric function of roots; Transformation of equations; Cardan's Method of solution of cubic equation of the form  $ax^3+bx+c=0$  ( $a \neq 0$ ); Inequalities involving Arithmetic and Geometric means;

**Unit –III**

**Marks-10**

Sequences and their convergence and divergence , Monotonic and Bounded Sequence and the theorems involving them; Infinite series of constant term; Convergence and divergence of the series of positive terms; Tests of convergence- Comparison test, d-Alembert's ratio test; Raabe's test, Cauchy's root test (without proof).

**GROUP-B**  
**TRIGONOMETRY**

(Marks-20)

**Unit -IV**

**Marks-10**

De' Moivre's theorem (for rational indices), Expansions of  $\sin n\theta$  &  $\cos n\theta$ , Expansions of  $\sin\theta$  &  $\cos \theta$  in ascending powers of  $\theta$ , Functions of complex arguments.

**Unit -V**

**Marks-10**

Gregory's series; summation of trigonometric series; Hyperbolic functions.

**MTMP-201**  
**MODERN ALGEBRA & GEOMETRY (2-D)**

(To answer one question from each unit. Each unit will have provision for internal choice.)

**GROUP-A**  
**MODERN ALGEBRA**

**(Marks –30)**

**Pre-requisites:** Theory of sets, Mapping, Equivalence relations.

**Unit –I**

**Marks-10**

Group, Permutation group, Cyclic group Subgroup, Cosets and their properties, Lagrange's theorem for order of a subgroup, Normal subgroup, Quotient group.

**Unit –II**

**Marks-10**

Definitions, examples and simple properties of Rings, Integral domains, Skew fields, Fields

**Unit –III**

**Marks-10**

Vector spaces, subspace, Linear independence, Basis and dimension.

**GROUP-B**  
**GEOMETRY(2-D)**

**(Marks-20)**

**Unit -IV**

**Marks-10**

Change of axes, pair of straight lines, general equation of second degree, reduction to standard forms.

**Unit -V**

**Marks-10**

Properties of a parabola, an ellipse, a hyperbola, equations of chord, tangent & normal, polar equation of a conic.

**MTMP-301**  
**DIFFERENTIAL CALCULUS & INTEGRAL CALCULUS**

(To answer one question from each unit. Each unit will have provision for internal choice.)

**GROUP-A**  
**DIFFERENTIAL CALCULUS**  
**(Marks –30)**

**Unit –I**

**Marks-10**

Limit, Cauchy's criterion for existence of limit (without proof), problems on limits. Continuity Problems on continuity, Bounded functions – l.u.b., g.l.b., Properties of continuous and bounded functions, Differentiability, Problems on differentiability, Relation between continuity and differentiability, Successive differentiation – Standard cases, Leibnitz's theorem and its application in simple cases.

**Unit –II**

**Marks-10**

Indeterminate forms  $0 \cdot \infty$ ,  $\infty - \infty$ ,  $0^0$ ,  $1^\infty$ ,  $\infty^0$ ,  $\frac{\infty}{\infty}$ ,  $\frac{0}{0}$ , Application of L Hospital's Theorem.

Rolle's Theorems, Lagrange and Cauchy forms of Mean value Theorem. Statement and applications of Taylor's and Maclaurin's Theorems, Taylor's and Maclaurin's Series, Expansions of functions  $e^{ax}$ ,  $\sin x$ ,  $\cos x$ ,  $\tan x$ ,  $\sinh x$ ,  $\cosh x$  (Assuming  $R_n \rightarrow 0$  as  $n \rightarrow \infty$ ), Maxima and Minima for functions of one variable, Necessary and sufficient condition for maxima & minima.

**Unit –III**

**Marks-10**

Function of two or more variables- partial derivatives, Euler's Theorem (proof for two variables only and problems for two and three variables).

Tangents, Normals – Equations and Properties of Tangents and Normals, Subtangents and Subnormal of Cartesian and polar curves. Geometrical problems, Simple problems of two variables.

**GROUP-B**  
**INTEGRAL CALCULUS**

**(Marks-20)**

**Unit -IV**

**Marks-10**

Definition and properties of definite integrals, Fundamental theorem, Reduction formulae.

**Unit -V**

**Marks-10**

Rectification of plane curves- Cartesian and polar curves, Area bounded by plane curves- Cartesian and polar curves, Volumes and surface of solid of Revolution about axes- Cartesian curves.

**MTMP-401**  
**DIFFERENTIAL EQUATIONS & VECTORS**

(To answer one question from each unit. Each unit will have provision for internal choice.)

**GROUP-A**  
**DIFFERENTIAL EQUATIONS**  
(Marks –30)

**Unit –I** **Marks-10**

Solution of first order and first degree differential equations- Variable separable method, Homogeneous equations., Exact equations.

**Unit –II** **Marks-10**

Linear equations (including Bernoulli's equation, and other simple cases reducible to linear equations.), Orthogonal Trajectories.

**Unit –III** **Marks-10**

Higher order linear differential equations with constant coefficients, Homogeneous linear differential equations, Application of differential equations in simple cases.

**GROUP-B**  
**VECTORS**

(Marks-20)

**Unit -IV** **Marks-10**

Vector equation- Vector equations of lines, planes and spheres  
Vector functions – Differentiation of vector point functions, properties and applications.

**Unit -V** **Marks-10**

Operation with del operator- Gradient, Divergence and Curl, their identities and application in simple problems.

**MTMP-501**

**DYNAMICS & STATICS**

(To answer one question from each unit. Each unit will have provision for internal choice.)

**GROUP-A**  
**DYNAMICS**  
**(Marks –30)**

**Unit –I**

**Marks-10**

Motion in a line with variable acceleration (under some law of velocity, inverse square law), Simple harmonic motion, Tangential and normal components of velocity and acceleration in a plane.

**Unit –II**

**Marks-10**

Motion in a plane- Projectile (excluding range on an inclined plane), motion inside and outside a smooth vertical circle.

**Unit –III**

**Marks-10**

Impulse, Work, Energy- Impulse of a force, work, power, energy, principle of energy, conservation of linear momentum and energy. Impact- Direct impact of two elastic bodies, Direct impact of an elastic body on a smooth fixed plane.

**GROUP-B**  
**STATICS**

**(Marks-20)**

**Unit -IV**

**Marks-10**

Coplanar forces-Condition of equilibrium on smooth planes, Frictions-Laws of friction, equilibrium on rough planes.

**Unit -V**

**Marks-10**

Centre of gravity- C.G. of a triangle formed by three rods, C.G. of an arc and a sector of a circle, of a quadrant of an ellipse, of a cardioide, of an asteroid, and of a lamina bounded by a parabola and a line.

**MTMP-601**  
**CLASSICAL ALGEBRA & TRIGONOMETRY**

(To answer one question from each unit. Each unit will have provision for internal choice.)

**GROUP-A**  
**LINEAR PROGRAMMING**

(Marks –30)

**Unit –I**

**Marks-10**

Introduction , brief idea about O.R. and its applications, convex sets and their properties, hyper plane, formation of an L.P.P. Different models, solution by graphical method.

**Unit –II**

**Marks-10**

Standard form of an L.P.P., feasible, basic, optimal, unbounded solution, solution of the standard L.P.P. by Simplex method, Big-M method.

**Unit –III**

**Marks-10**

Concept of duality, formation of dual problems, standard results on duality, advantages of duality, Transportation problems.

**GROUP-B**  
**SOLID GEOMETRY**

(Marks-20)

**Unit -IV**

**Marks-10**

Equation of straight lines, shortest distance between lines and its equation

**Unit -V**

**Marks-10**

Sphere, cone; Tangent lines and planes.

## Recommended Books

### MTMP-101

1. Higher Algebra	By	Das and Mukherjee
2. Do	“	B , Das
3. Higher Algebra	“	Bernard and Child.
4. Classical Algebra	“	S.K .Mapa.
5. Higher Trigonometry	By	Das and Mukherjee

### MTMP-201

1. Modern Algebra	“	A.R.Vasistha.
2. Higher Algebra	“	Roy and Sarma.
3. Modern Algebra	“	Surjeet Singh et al.
4. University Algebra	“	Gopal Krishna.
5. Abstract Algebra	“	J.B. Fraleigh.
6. Analytical Geometry	By	Ghosh and Chakraborty.
7. Analytical Geometry	“	J.M. Kar.

### MTMP-301

1. Differential Calculus	By	Das and Mukherjee.
2. Do	“	Maity and Ghosh.
3. Do	“	Shanti Narayan.
4. Do	“	P.N. Chatterjee.
5. Integral Calculus	“	Das and Mukherjee.
6. Do	“	Maity and Ghosh
7. Do	“	Shanti Narayan.



### **MTMP-401**

1. Differential equation	“	J.M. Kar.
2. Do	“	M.L. Khanna.
3. Do	“	M.D. Rai Singhanian.
4. Do	“	J.N. Sharma.
5. Differential Equation and their Application	“	Z. Ahsan.
6. Vector Analysis	“	Maity and Ghosh.
7. Vector Algebra	“	Shanti Narayan.

### **MTMP-501**

1. Statics		S.L. Loney
2. Statics		Das and Mukherjee
3. Dynamics		P.N. Chatterjee
4. Dynamics		M. Roy and H.S. Sharma

### **MTMP-601**

1. Linear Programming	“	Kanti Swarup , P.K.Gupta
2. Operation Research	“	R.K.Gupta
3. Do	“	Kanti Swarup ,Manmohan
4. Solid Geometry	“	Shanti Narayan.
5. Co-ordinate Geometry	“	S.L. Loney.
6. Analytical Geometry of two and three Dimension with vector analysis		B. Das