

TDC SYLLABUS FOR MATHEMATICS [PASS COURSE—ARTS/ SCIENCE STREAM]

COURSE STRUCTURE

Paper	Name of the paper	Course	Marks	Lectures
TDC-P-101	Classical Algebra & Trigonometry	A. Classical Algebra	30	54
		B. Trigonometry	20	36
TDC-P-201	Modern Algebra & Geometry (Two – Dimensions 2-D)	A. Modern Algebra	30	54
		B. Geometry (2-D)	20	36
TDC-P-301	Differential Calculus & Integral Calculus	A. Differential Calculus	30	54
		B. Integral Calculus	20	36
TDC-P-401	Differential Equations & Vector Analysis	A. Differential Equations	30	54
		B. Vector Analysis	20	36
TDC-P-501	Dynamics & Statics	A. Dynamics	30	54
		B. Statics	20	36
TDC-P-601	Linear Programming & Solid Geometry (3-D)	A. Linear Programming	30	54
		B. Solid Geometry(3-D)	20	36

Total : Six Semesters : 06 Papers : Marks : 300 : 540 Lectures
(Duration : One Hour Per Lecture)

FIRST SEMESTER
MTMP-101
CLASSICAL ALGEBRA & TRIGONOMETRY

Full Marks : 50

Pass Marks : 17

(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 equation 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 θ , Functions of complex arguments.

Unit-V

Marks-10

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

SECOND SEMESTER

MTMP-201

MODERN ALGEBRA & GEOMETRY (2-D)

Full Marks : 50

Pass Marks : 17

(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 relation.

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.

THIRD SEMESTER

MTMP-301

DIFFERENTIAL CALCULUS & INTEGRAL CALCULUS

Full Marks : 50

Pass Marks : 17

(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^∞ , ∞^0 , $\frac{\infty}{\infty}$, $\frac{0}{0}$ Application of L Hospital's Theorem.

Rolle's Theorems, Lagrange and Cauchy forms of Mean value Theorems, Statement and applications of Taylor's and Maclaurin's Theorems, Taylor's and Maclaurin's Series, Expansion 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 Subnormals 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 areas of solids of Revolution about axes- Cartesian curves.

FOURTH SEMESTER**MTMP-401****DIFFERENTIAL EQUATIONS & VECTORS****Full Marks : 50****Pass Marks : 17**

(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 equations - 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 applications in simple problems.

FIFTH SEMESTER
MTMP-501
DYNAMICS & STATICS

Full Marks : 50

Pass Marks : 17

(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 astroid, and of a lamina bounded by a parabola and a line.

SIXTH SEMESTER

MTMP-601

LINEAR PROGRAMMING & SOLID GEOMETRY (3-D)

Full Marks : 50

Pass Marks : 17

(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 (3-D)

(Marks-20)

Unit-IV

Marks-10

Equation of straight lines, shortest distance between lines, Equation of the line of shortest distance.

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	"	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	"	Ghosh and Chakraborty.
7.	Analytical Geometry	"	J.M. Kar.

MTMP-301

1.	Differential Calculus	"	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 Singhania.

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| 4. | Do | " | J.N. Sharma. |
| 5. | Differential Equation
and their Applications | " | Z. Ahsan. |
| 6. | Vector Analysis | " | Maity and Ghosh. |
| 7. | Vector Algebra | " | Shanti Narayan. |

MTMP-501

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| 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

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| 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 | " | B. Das |

Dimensions with vector analysis