



B.Sc. MATHEMATICS  
SEMESTER-I

**SEMESTER PATTERN :**

- The Course content has been designed on **Semester pattern**.
- The workload for Theory is allotted on Semester pattern.
- There shall be **one Theory paper of 70 marks** of 2.5 Hours duration.
- There shall be **one Practical paper of 50 marks** of 3 Hours duration.

Subject Code	Type of Course	Course name	Credit	Class room/lab hrs per week	Marks Ext.	Exam Duration	Marks Internal	Marks
22843	MATCC103	CALCULUS & MATRIX ALGEBRA (THEORY)	4	4	70	2.5	30	100
22844	MATCC104	CALCULUS & MATRIX ALGEBRA (PRACTICAL)	2	4	50	3	--	50

Internal	Marks
Test	15
Assignment / Presentation	10
Seminar / Presence	05
Total	30



B.Sc. MATHEMATICS  
SEMESTER-II

**SEMESTER PATTERN :**

- The Course content has been designed on **Semester pattern**.
- The workload for Theory is allotted on Semester pattern.
- There shall be **one Theory paper of 70 marks** of 2.5 Hours duration.
- There shall be **one Practical paper of 50 marks** of 3 Hours duration.

Subject Code	Type of Course	Course name	Credit	Class room/lab hrs per week	Marks Ext.	Exam Duration	Marks Internal	Marks
22845	MATCC203	ORDINARY DIFFERENTIAL EQUATION & THREE DIMENSIONAL GEOMETRY (THEORY)	4	4	70	2.5	30	100
22846	MATCC204	ORDINARY DIFFERENTIAL EQUATION & THREE DIMENSIONAL GEOMETRY (PRACTICAL)	2	4	50	3	--	50

Internal	Marks
Test	15
Assignment / Presentation	10
Seminar / Presence	05
Total	30



**B.Sc. MATHEMATICS**  
**SEMESTER-I**

**Paper No: MATCC103**

Title of the Paper : **CALCULUS & MATRIX ALGEBRA(THEORY)**

Credits: 04      Hours: 04/week      Marks: 100

Marks: Semester End Examination: **70Marks**

Continous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks/Weight
1	Revision of algebra of derivatives and its standard forms, Successive Derivatives, standard results for $n^{th}$ derivative, Leibniz's Theorem and examples based on it. Definition of limit of a sequence, Convergence and divergence of an infinite series, Comparison test, Ratio test, Root test, Radius and interval of convergence of power series.	16	17
2	Revision of algebra of integration and its standard forms, Reduction Formulae for $\int \sin^n x dx$ , $\int \cos^n x dx$ , $\int \sin^m x \cos^n x dx$ and $\int_0^{\frac{\pi}{2}} \sin^n x dx$ , $\int_0^{\frac{\pi}{2}} \cos^n x dx$ , $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x dx$ , Where $m, n \in \mathbb{N}$ with $m, n \geq 2$ . Mean value theorems: Rolle's theorem, Lagrange's and Cauchy's theorem. and Taylor's theorem (without proof). Expansion in power series of $\sin x$ , $\cos x$ , $\log(1+x)$ , $e^x$ and $(1+x)^m$ (in appropriate domain), L'Hospital's Rules and its examples.	16	18
3	Matrices: matrix operations (Addition, Scalar Multiplication, Multiplication, Transpose, Adjoin and their properties); Special types of matrices: Null, Identity, Diagonal, Triangular, Symmetric, Skew-Symmetric, Hermitian, Skew-Hermitian, Orthogonal, Unitary, Normal, Idempotent, Nilpotent, Involuntary, Algebra of determinants and its properties, Solution of the matrix Equation $Ax = b$ ; Row reduced Echelon form of matrix and Matrix inversion using it, Linear dependence and independence of rows and columns of a matrix. Row rank, column rank and rank of a matrix. Equivalence of row rank and column rank of matrix.	16	18
4	Eigen values, eigenvectors and the characteristics equation of a matrix. Cayley- Hamilton theorem and its use in finding inverse of a matrix. Application of matrices to a system of a linear equation. Theorems on system of consistency of linear equations, solution of system linear equation in three variables by Cramer's rule.	12	17



**Reference books:**

- A first course in calculus fifth edition By Serge Lang , Springer India
- Calculus - Dr. Elliot Mendel son, Mc GrawHill Book co.
- Calculus - Thomas and Finney , Pearson Education , Asian edition
- Calculus and Analytic Geometry - G. B. Thomas and R. L. Finney. Pearson Education. Indian Reprint.
- Differential Calculus by Shanti Narayan & Differential Calculus by Gorakh Prasad
- Higher Algebra by Barnard S. and Child J. M.
- Higher Algebra by H. S. Hall and S. R. Knight H. M.
- Integral Calculus by Shanti Narayan & Integral Calculus by Gorakh Prasad
- Linear Algebra by Kenneth M Hoffman (PEARSON )
- Mathematical sciences( UGC CSIR) by Pawan Sharma, Neha Sharma and Suraj singh. (Arihant publication india)
- Matrix and linear algebra by K. B. Dutta Prentice Hall
- Theory of matrices by Vatssa Wiley-Eastern & Element of co-ordinate Geometry by S. L. Loney and Elementary Treatise on Co-ordinate Geometry by R. J. T. Bell



**B.Sc. MATHEMATICS**  
**SEMESTER-I**

**Paper No: MATCC104**

**Title of the Paper : CALCULUS & MATRIX ALGEBRA(PRACTICAL)**

Credits: 02    Duration: 02 Hours/practical    Hours: 04/week    Marks: 50

**LIST OF PRACTICALS**

1. Graphs of Trigonometric functions:  $y = \text{asin}(bx+c)$ ,  $y = \text{acos}(bx+c)$ ,  $y = \text{atan}(bx+c)$ .
2. Graphs of Trigonometric functions:  $y = \text{acosec}(bx+c)$ ,  $y = \text{asec}(bx+c)$ ,  $y = \text{acot}(bx+c)$ .
3. Graphs of Inverse Trigonometric functions:  $y = \text{asin}^{-1}(bx+c)$ ,  $y = \text{acos}^{-1}(bx+c)$ ,  $y = \text{atan}^{-1}(bx+c)$ .
4. Graphs of Inverse Trigonometric functions:  $y = \text{acosec}^{-1}(bx+c)$ ,  $y = \text{asec}^{-1}(bx+c)$ ,  $y = \text{acot}^{-1}(bx+c)$ .
5. Find  $n^{\text{th}}$  derivative of the functions using Leibnitz's rule.
6. Using Ratio test, Discuss convergence of infinite Power series.
7. Using Cauchy root test, Discuss convergence of infinite Power series.
8. Find definite integrals as limit of sum.
9. Find definite integrals by method of partial fraction.
10. Find definite integrals using integration by parts.
11. Find definite integrals using reduction formulae..
12. Geometrical interpretation of M.V.T. and problems of M.V.T.
13. Expansions of functions in infinite power series using Taylor and Macalurin's formulae.
14. Evaluate limit using L'Hospital's rule.
15. Find rank of matrix using Row reduced Echelon form.
16. Find inverse of matrix using Row reduced Echelon form.
17. Application of Cayle-Hamilton theorem.
18. Solution of matrix equation  $AX = B$ .
19. Find Eigen vectors of square matrix of order 3
20. Solution of system of linear equations of three variables using Row reduced Echelon form.
21. Solution of system of linear equations of three variables using Cramer's rule.

**Reference books:**

- Mathematical sciences( UGC CSIR) by Pawan Sharma, Neha Sharma and Suraj singh. (Arihant publication india)
- Play with graphs by Amit m. agarwal (Arihant publication india)
- A Textbook for class XI & XII , National Council of Educational Research and Training.
- Calculus and Analytic Geometry - G. B. Thomas and R. L. Finney. Pearson Education. Indian Reprint.



**B.Sc. MATHEMATICS**  
**SEMESTER-II**

**Paper No: MATCC203**

**Title of the Paper: ORDINARY DIFFERENTIAL EQUATION**  
**& THREE DIMENSIONAL GEOMETRY (THEORY)**

Credits: 04    Hours: 04/week    Marks: 100  
Marks: Semester End Examination: **70Marks**  
Continous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks/Weight
1	Revision of Ordinary differential equation , Order and degree of differential equation, Variable separable equation, Homogeneous differential equation and Non- homogeneous differential equations. Differential Equations of First Order and First Degree: Definition and method of solving of Linear differential equations of first order and first degree. Definition and method of solving of Bernoulli's differential equation and Definition and methods of solving of Exact differential equation. Differential equations of first order and higher degree: Differential equations of first order and first degree solvable for x, solvable for y, solvable for p.	12	18
2	Clairaut's form of differential equation and Lagrange's form of differential equations. Linear differential equations of higher order Linear differential equations of higher order with constant coefficients. Operator D, Meaning of auxiliary equation, Roots of auxiliary equation and solution of auxiliary equation $f(D)y = 0$ for real roots and complex roots, Operator $1/D$ . Solution of differential equations of the type $f(D)y = X$ . Meaning of complimentary function(C.F.) and Particular integral(P.I.). Methods to obtain Particular integral(P.I.) when $X = e^{ax}$ , $X = \sin(ax+b)$ , $X = \cos(ax+b)$ , $X = x^m$ , $X = e^{ax}.V$ .	16	18
3	Linear differential equations with variable coefficients. Their applications, equation reducible to with constant coefficients. Second order linear differential equations. Sphere, Intersection of a line and a sphere. Equation of tangent plane and normal. Plane section of sphere. Intersection of two spheres. Angle between two spheres. Orthogonal spheres.	16	17



4	Definition of a cone. Its vertex and guiding curve. Its equation with given vertex and guiding curve. Homogenous equation and cone with vertex origin. Right circular cone. Its equation with given vertex, axis and semi vertex angle. Definition of a cylinder. Its equation with generators intersecting a given curve and parallel to a line. Right circular cylinder. Its equation with given axis and radius. Conicoids: Central and non-central conicoids, Ellipsoid, Hyperboloid of two sheets and one sheet. Elliptic paraboloid and hyperbolic paraboloid. Intersection of a line and a conicoid. Equation of tangent plane and normal of conicoids.	16	17
---	--	----	----

**Reference books:**

- A first course in calculus fifth edition By Serge Lang , Springer India
- Calculus - Dr. Elliot Mendel son, Mc GrawHill Book co.
- Calculus - Thomas and Finney , Pearson Education , Asian edition
- Calculus and Analytic Geometry - G. B. Thomas and R. L. Finney. Pearson Education. Indian Reprint.
- Differential Calculus by Shanti Narayan & Differential Calculus by Gorakh Prasad
- Higher Algebra by Barnard S. and Child J. M.
- Higher Algebra by H. S. Hall and S. R. Knight H. M.
- Integral Calculus by Shanti Narayan & Integral Calculus by Gorakh Prasad
- Mathematical sciences (UGC CSIR) by Pawan Sharma, Neha Sharma and Suraj singh. (Arihant publication india)
- Three Dimensional Geometry by Jwala prasad (PEARSON )



**B.Sc. MATHEMATICS**  
**SEMESTER-II**

**Paper No: MATCC204**

**Title of the Paper : ORDINARY DIFFERENTIAL EQUATION  
& MATRIX ALGEBRA(PRACTICAL)**

Credits: 02    Duration: 02 Hours/practical    Hours: 04/week    Marks: 50

**LIST OF PRACTICALS**

1. Practical problem based on homogeneous differential equation.
2. Practical problem based on non-homogeneous differential equation.
3. Practical problem based on linear differential equations of first order and first degree.
4. Practical problem based on method of solving of Bernoulli's differential equation.
5. Practical problem based on method of solving Exact differential equation.
6. Practical problem based on method of solving Lagrange's differential equations.
7. Practical problem based on method of solving differential equations of the type  $f(D)y = e^{ax}$ .
8. Practical problem based on method of solving differential equations of the type  $f(D)y = \sin(ax+b)$ .
9. Practical problem based on method of solving differential equations of the type  $f(D)y = \cos(ax+b)$ .
10. Practical problem based on method of solving differential equations of the type  $f(D)y = x^n$
11. Practical problem based on method of solving differential equations of the type  $f(D)y = e^{ax}x^n$
12. Practical problem based on method of solving differential equations of the type  $f(D)y = e^{ax}\sin(ax + b)$ .
13. Practical problem based on method of solving differential equations of the type  $f(D)y = e^{ax}\cos(ax + b)$ .
14. Practical problem based on method of solving Linear differential equations with variable coefficients.
15. Practical based on problems of sphere.
16. Practical based on problems of cone.
17. Practical based on problems of cylinder.
18. Practical based on problems of central conicoids.
19. Practical based on problems of non central conicoids.
20. Practical based on problems of tangent plane of central conicoids.
21. Practical based on problems of tangent plane of non central conicoids.





**Reference books:**

- Differential Calculus by Shanti Narayan & Differential Calculus by Gorakh Prasad
- Mathematical sciences( UGC CSIR) by Pawan Sharma, Neha Sharma and Suraj singh. (Arihant publication india)
- Ordinary and Partial Differential Equations by Dr. M. D. Raisinghanian (S. Chand).
- Three Dimensional Geometry by Jwala prasad (PEARSON )