

SHRI GOVIND GURU UNIVERSITY

Choice Based Credit System (CBCS)
Syllabus for B. Sc. Semester I (Mathematics)
MAT 101: Calculus and Matrix Algebra (Theory)

Hours: 4 /week

Credits: 4

Prerequisite: Limit and Continuity, Differentiability of function of one variable. Introduction to matrix and operation on matrices.

Unit I:

Successive Derivatives, Leibniz's Theorem, Taylor's and Maclaurin's Theorems (both without proof), Taylor's and Maclaurin's series of functions e^x , $\sin x$, $\cos x$, $\log(1+x)$, $(1+x)^m$.

Unit II:

Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem and their geometric interpretations, Increasing and decreasing functions, Indeterminate forms, L'Hospital's Rule I and L'Hospital's Rule II with proof and all other forms.

Unit III:

Special type of matrices and their properties, Elementary operations on matrices, Linear dependence and independence of row and column matrices and rank of a matrix, Row Reduced Echelon (RRE) form of a matrix and matrix inversion using it.

Unit IV:

Eigen values, Eigen vectors and the characteristic equation of a matrix, Cayley-Hamilton (CH) theorem and its use in finding inverse of a matrix, Application of matrices in solving a system of simultaneous linear equations, Cramer's rule, Theorems on consistency of a system of simultaneous linear equations, Diagonalization of a symmetric matrix.

Reference Books:

1. Differential Calculus – Shanti Narayan, P.K. Mittal, S. Chand and Co.
2. Calculus and Analytic Geometry – G. B. Thomas and R. L. Finney. Pearson Education. Indian Reprint.
3. Calculus – James Stewart, Sixth edition, (E-Book).
4. Matrix and Linear Algebra – K. B. Dutta, Prentice Hall.
5. A Textbook of Matrices – Shanti Narayan, P K Mittal, S. Chand Group.
6. Introduction to Linear Algebra – V. Krishnamurthy, Affiliated East-west Press Pvt Ltd.

SHRI GOVIND GURU UNIVERSITY

Choice Based Credit System (CBCS)
Syllabus for B. Sc. Semester I (Mathematics)
MAT 102: Calculus and Matrix Algebra (Practical)

Hours: 4 /week

Credits: 3

Number of Practicals: 12

Duration: 2hrs/Practical

List of Practicals:

1. Graphs of Trigonometric and inverse trigonometric functions.
2. Finding the n^{th} derivative of some standard functions and their values at given points.
3. Application of Leibnitz theorem.
4. Expansions of functions in infinite power series using Taylor's and Maclaurin's formulae.
5. Problems on Mean Value Theorems.
6. Evaluation of limit using L'Hospital's rules.
7. Finding RRE form and rank of matrix.
8. Finding inverse using Gauss Jordan method (using row operation method).
9. Verification of Cayley-Hamilton (CH) theorem - inverse of matrix using it, Problems on Cayley-Hamilton theorem.
10. Finding Eigen values and Eigen vectors.
11. Solution of system of linear equations using row operations and Cramer's rule.
12. Problems on symmetric and Hermitian matrix.

SHRI GOVIND GURU UNIVERSITY

Choice Based Credit System (CBCS)

Syllabus for B. Sc. Semester II (Mathematics)

MAT 103: Differential Equations and Co-ordinate Geometry (Theory)

Hours: 4 /week

Credits: 4

Prerequisite: Introduction of Differential equations, its order and degree, Family of curves leading to differential equation, geometric interpretation of solutions, Variables separable, Homogeneous and non-homogeneous differential equations.

Unit I:

Exact differential equations (without proof), Integrating factors, Linear differential equation, Bernoulli's differential equation , Differential Equations reducible to linear equation. Method of solving differential equations of first order and higher degree: solvable for y , solvable for x , solvable for p (where $p = \frac{dy}{dx}$), Clairaut's differential equation (both general and singular).

Unit II:

Linear differential equations of higher order and degree one: Differential operators (D and θ): Linear differential equations of higher order and degree one with constant coefficients, Complementary Function and Particular Integrals , Inverse operator, Operational methods for its solutions, Euler form of linear differential equations with variable coefficients.

Unit III:

Definition of a sphere in \mathbb{R}^3 , Cartesian equation of a sphere, General equation of a sphere, Equation of a sphere with diametrically opposite end points, Intersection of a sphere with Line/plane/sphere (No theory but only problems), Equation of a tangent plane to a sphere, The tangency of a plane and normality of a line to a sphere, Orthogonal spheres.

Unit IV:

Polar coordinate system : Polar coordinates in \mathbb{R}^2 & \mathbb{R}^3 and its Relationships with Cartesian coordinates, polar equation of line /circle /conic and properties of conics.

Different types of cones and cylinders, Equations of enveloping cone/cylinder. Right circular cone/cylinder (without proof). Problems on cone and cylinder.

Reference Books:

1. Calculus – James Stewart, Sixth edition Brook Cole Publication
2. Calculus - Thomas and Finney , Pearson Education , Asian edition .
3. Introductory course in Differential equations-Murray,Ulan Press.
4. Elementary Differential equations –Kella , Mcgraw-Hill.
- 5.Co-ordinate Geometry By : R.J.T. Bell
6. Solid Geometry(three dimension) – H. K. Das ,S. C. Saxena and Raisinghania , S. Chand.
7. Differential equations and their applications, - Zafar Ahsan, Prentice Hall of India (2004).
8. Analytical solid geometry – Shanti Narayan, S.Chand & Company

SHRI GOVIND GURU UNIVERSITY

Choice Based Credit System (CBCS)
Syllabus for B. Sc. Semester II (Mathematics)
MAT 104: Differential Equations and Co-ordinate Geometry (Practical)

Hours: 4 /week

Credits: 3

Number of Practicals: 12

Duration: 2hrs/Practical

List of Practicals:

1. Graphs of Cartesian curves (Circle, Parabola, Ellipse, and Hyperbola).
2. Graphs of Cartesian curves (Logarithm function, Exponential function, $\sinh x$, $\cosh x$ and $\tanh x$).
3. Examples on use of reduction formulas: $\int_0^{\pi/2} \sin^n x dx$, $\int_0^{\pi/2} \cos^n x dx$, $\int_0^{\pi/2} \tan^n x dx$ and $\int_0^{\pi/2} \sin^m x \cos^n x dx$.
4. Solution of differential equations of order 1 & degree 1.
5. Solution of differential equations of order 1 & higher degree.
6. Solution of differential equations of higher order with constant coefficients.
7. Solution of differential equations of higher order with variable coefficients.
8. The mutual relation between polar and Cartesian coordinate system in R^2 and Transformation equation from one system to another system.
9. The mutual relations among Cartesian, Cylindrical and Spherical coordinate system in R^3 and Transformation equation from one system to another system.
10. Problems on sphere.
11. Problems on cone.
12. Problems on Cylinder.