CALCULUS AND APPLICATIONS

I Semester

Course Code:	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
A5BS01	**BSC**	3	1	-	4	30	70	100

COURSE OBJECTIVES
To learn
1. The concept of differential equations and solve them using appropriate methods
2. Usage of the appropriate test to find the convergence and divergence of the given series
3. Concept of Rank of a matrix, Consistency and solving system of linear equations.
4. Evaluation of differential equation using Laplace Transform techniques.
5. The partial derivatives of several variable functions.

UNIT-I	ORDINARY DIFFERENTIAL EQUATIONS

Introduction- Exact and reducible to Exact differential equations-Newton's Law of cooling-Law of Growth and Decay. Linear differential equations of second and higher order with constant coefficients - Non-Homogeneous term of the type $Q(x) = e^{ax}$, Sin ax, Cosax, $e^{ax}v(x)$, $x^n v(x)$ - Method of variation of parameters.

UNIT-II	SEQUENCES AND SERIES

Basic definitions of Sequences and series – Convergence and divergence –Comparison Test- Ratio Test – Raabe's Test-Integral Test – Cauchy's n^{th} root Test –Absolute and Conditional convergence – Power Series.

UNIT-III	THEORY OF MATRICES

Finding rank of a matrix by reducing to Echelon form,Consistency of system of linear equations (homogeneous and non-homogeneous) using the rank of a matrix, Eigen values and Eigen vectors and its properties(with out proof),Cayley-Hamilton theorem (Statement and verification)-Finding inverse and powers of a matrix by Cayley-Hamilton theorem, Diagonalisation of matrices.

UNIT-IV	LAPLACE TRANSFORMS

Laplace transforms of elementary functions- First shifting theorem - Change of scale property – Multiplication by t^n- Division by t – Laplace transforms of derivatives and integrals – Unit step function – Second shifting theorem – Periodic function – Evaluation of integrals by Laplace transforms – Inverse Laplace transforms- Method of partial fractions – Other methods of finding inverse transforms – Convolution theorem – Applications of Laplace transforms to ordinary differential equations.

UNIT-V	CALCULUS OF SEVERAL VARIABLES

Limit, Continuity - Partial derivative- Partial derivatives of higher order -Total derivative –
Chain rule,Jacobians-functional dependence & independence.
Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints)

Text Books:

1. Ervin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

2. B.S.Grewal, Higher Engineering Mathematics, Khanna publishers, 36th Edition, 2010.

Reference Books:

1. R.K.Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Fifth Edition, 2001.
2. N.P Bali and Manish Goyal ,A Text of Engineering Mathematics, Laxmi publications,2008.

COURSE OUTCOMES
At the end of the course, student will be able to:

1. Identify the different types of differential equations and solve them using appropriate methods.
2. Apply the appropriate test to find the convergence and divergence of the given series.
3. Solve the system of linear equations using rank of the matrices.
4. Solve the differential equations using Laplace transform techniques.
5. Find the Maxima and Minima of several variable functions.