SCHEME OF COURSE WORK

Course Details:

Course Title	Calculus and Linear Algebra		
Course Code	19BM1101	**L T P C**	3 1 0 4
Program	B.Tech		
Specialization	Electrical and Electronics Engineering		
Semester	I Semester		
Prerequisites	• Basic formulae of differentiation, product rule, and quotient rule. • Basic Integration formulae, integration by parts, definite integrals and properties • solve a linear system of equations analytically and compute eigen values and eigen vectors of a square matrix		
Courses to which it is a prerequisite	For all Engineering Courses		

PROGRAM OUTCOMES:

1. A graduate of **Electrical and Electronics Engineering**will be able to apply the knowledge of mathematics, science, engineering fundamentals to solve complex **Electrical and Electronics Engineering** problems.
2. A graduate of **Electrical and Electronics Engineering** will be attaining the capability to identify, formulate and analyse problems related to **Electrical and Electronics Engineering**.
3. A graduate of **Electrical and Electronics Engineering** will be in a position to design solutions for system components and processes that meet the specified needs with appropriate consideration for public health and safety.
4. A graduate of **Electrical and Electronics Engineering** will be able to conduct experiments, perform analysis and interpretation of data by using research methods such as design of experiments to synthesize the information and to provide valid conclusions.
5. A graduate of **Electrical and Electronics Engineering** will be able to select and apply appropriate techniques from the available resources.
6. A graduate of **Electrical and Electronics Engineering** will be able to carry out their professional practice in **Electrical and Electronics Engineering** by appropriately considering and weighing the issues related to society.
7. A graduate of **Electrical and Electronics Engineering** will be able to understand the impact of the professional engineering solutions on environmental safety and legal issues.
8. A graduate of **Electrical and Electronics Engineering** will be transform into responsible citizens by resorting to professional ethics and norms of the engineering practice.
9. A graduate of **Electrical and Electronics Engineering** will be able to function effectively in individual capacity as well as a member in diverse teams and in multidisciplinary streams.
10. A graduate of **Electrical and Electronics Engineering** will be able to communicate fluently with the engineering community and society, and will be able to prepare reports and make presentations effectively.
11. A graduate of **Electrical and Electronics Engineering** will be able to apply knowledge of the engineering and management principles to managing projects and finance in multidisciplinary environments.
12. A graduate of **Electrical and Electronics Engineering** will be engage themselves in independent and life-long learning to continuing professional practice in their specialized areas of **Electrical and Electronics Engineering**

Course Outcomes (COs):

CO 1 Test the convergence of an infinite series and express a function in terms of power series.
CO 2 Apply the techniques of multivariable differential calculus to determine extrema and series expansions of a function of several variables.
CO 3 Extend the concept of integration to higher dimensions and use it to solve problems in engineering.
CO 4 Solve a linear system of equations analytically and compute eigenvalues and eigen vectors of a square matrix
CO 5 Diagonalize a matrix and identify the nature of a quadratic form.

Course Outcome versus **Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	S	S										
CO-2	S	M										
CO-3	S	S										
CO-4	S	S										
CO-5	S	S										

S - Strongly correlated, *M - Moderately* correlated, *Blank - No correlation*

Assessment Methods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Sequence, infinite series tests for convergence: comparison test, ratio Test, root test.	**CO-1**	Test for the converge the series $\sum_{n=1}^{\infty}\left(\frac{n!3^n}{n^n}\right)$	Lecture / Problem solving	Assignment (Week 2 - 4) / Quiz-I (Week -8)/ Mid-Test 1 (Week 9)
2	Rolle's theorem, Lagrange's and Cauchy's mean value theorem	**CO-1**	Verify Lagrange's Mean Value theorem for $f(x)=(x-1)(x-2)(x-3)$ in [0,4]	Lecture / Problem solving	Assignment (Week 2 - 4)/ Quiz -I (Week -8)/ Mid-Test 1 (Week 9)
3	Expansions of functions: Taylor's and Maclaurin's series	**CO-1**	Expand $\sin^{-1}x$ in powers of x and y up to third degree	Lecture / Problem solving	Mid-Test 1 (Week 9)/ Assignment (Week 2 - 4)/ Quiz -I (Week -8)
4	Total derivative, change of variables, Jacobin's	**CO-2**	If $x = u(1-v)$, $y = uv$, then find $\frac{\partial(u,v)}{\partial(x,y)}$	Lecture / Problem solving	Mid-Test 1 (Week 9)/ Quiz -I (Week -8)
5	Taylor's theorem for functions of two variables	**CO-2**	Find the Taylor's series expansion of $e^x \sin y$ in powers of x and y	Lecture / Problem solving	Mid-Test 1 (Week 9) / Quiz -I (Week -8)
6	Maxima and minima of functions of two variables, Lagrange method of undetermined multipliers	**CO-2**	In the plane triangle ABC, find the maximum value of $\cos A \cos B \cos C$	Lecture / Problem solving	Mid-Test 1 (Week 9)/ Quiz -I (Week -8)
7	Non Cartesian Coordinates, Double integrals, Change of order of integration.	**CO-3**	Evaluate $\int_{-1}^{2}\int_{x^2}^{x+2} dy\,dx$.	Lecture / Problem solving	Mid-Test 1 (Week 9) / Quiz -I (Week -8)

8			**Mid-Test 1**	-------	----------
9	Double integral in polar co-ordinates Triple integrals, Change of variables in double integral.	**CO-3**	Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\, dxdy$ by changing to polar coordinates.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)/ Assignment (12-14)
10	Double integral in polar co-ordinates Triple integrals, Change of variables in double integral.	**CO-3**	Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\, dxdy$ by changing to polar coordinates.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)/ Assignment (12-14)
11	Change of variables in triple integral, Simple Applications of multiple integrals.	**CO-3**	Evaluate $\int_{x=0}^{1} \int_{y=0}^{x} \int_{z=0}^{x+y} x\, dzdydx.$	Lecture / Problem solving	Assignment (Mid-Test 2 (Week 18) / Quiz -II (Week -17)/ Assignment (12-14)
12	Rank of a matrix (echelon form and normal form	**CO-4**	Determine the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)/ Assignment (12-14)
13	Consistency of linear system of equations	**CO-4**	Consistency of linear system of equations $4x-2y+6z=8,$ $x+y-3z=-1,$ $15x-3y+9z=21$	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)
14	Eigen values and eigen vectors of a matrix, properties of eigen values	**CO-4**	Find the eigen values and eigen vectors for the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$, Two eigen values of the matrix $A=\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ are equal to 1 each.Find the eigen value of A^{-1}	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)
15	Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem	**CO-5**	Using Cayley –Hamilton theorem find the inverse of $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ 2 & -4 & -4 \end{bmatrix}$, find A^4	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)
16	Reduction to diagonal form,	**CO-5**	Reduce the matrix	Lecture / Problem	Mid-Test 2 (Week 18) /

			$A=\begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$ to the diagonal form	solving	Quiz -II (Week -17)
17	Reduction of quadratic form to canonical form, nature of the quadratic form	**CO-5**	Reduce the quadratic form $3x^2+5y^2+3z^2-2yz+2zx-2xy$ To the canonical form and discuss it's nature	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)
18	**Mid-Test 2**				
19/20	**END EXAM**				