SCHEME OF COURSE WORK

Course Details:

Course Title	**Calculus and Linear Algebra**		
Course Code	**22BM1101**	**L T P C**	**3 0 0 3**
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:

The student of Electrical and Electronics Engineering at the end of the program will be able to:

PO-1: Apply the knowledge of basic sciences and electrical and electronics engineering fundamentals to solve the problems of power systems and drives.

PO-2: Analyze power systems that efficiently generate, transmit and distribute electrical power in the context of present Information and Communications Technology.

PO-3: Design and develop electrical machines and associated controls with due considerations to societal and environmental issues.

PO-4: Design and conduct experiments, analyze and interpret experimental data for performance analysis.

PO-5: Apply appropriate simulation tools for modeling and evaluation of electrical systems.

PO-6: Apply the electrical engineering knowledge to assess the health and safety issues and their consequences.

PO-7: Demonstrate electrical engineering principles for creating solutions for sustainable development.

PO-8: Develop a techno ethical personality that help to serve the people in general and Electrical and Electronics Engineering in particular.

PO-9: Develop leadership skills and work effectively in a team to achieve project objectives.

PO-10: Communicate effectively in both verbal and written form.

PO-11: Understand the principles of management and finance to manage project in multi disciplinary environments.

PO-12: Pursue life-long learning as a means of enhancing the knowledge and skills.

Course Outcomes (COs): *At the end of the Course, Student will be able to*

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

3 - Strongly correlated, *2 - Moderately correlated, 1-Weakly 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**	Apply 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**	Use Taylor's series expansion for $\sin^{-1}x$ 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,	**CO-2**	If $x=u(1-v),\ y=uv,$	Lecture /	Mid-Test 1 (Week 9)/

	Jacobin's		then determine $\frac{\partial(u,v)}{\partial(x,y)}$	Problem solving	Quiz -I (Week -8)
5	Taylor's theorem for functions of two variables	**CO-2**	Determine 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, determine 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**	Discuss the 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**	Determine the eigen values and eigen vectors for the matrix	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)

			$\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$, 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}		
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**	Determine the eigen values and eigen vectors and hence reduce the matrix $A=\begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$ to a diagonal form	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)
17	Reduction of quadratic form to canonical form, nature of the quadratic form	**CO-5**	Discuss the nature of the quadratic form by reducing to canonical form $3x^2+5y^2+3z^2-2yz+2zx-2xy$	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)
18	**Mid-Test 2**				
19/20	**END EXAM**				