



Course Code: 24BMATE101
Credits: 4
SEE: 50% Marks
SEE Hours: 3 Hrs

Course: Mathematics-1 for EEE Stream
L:T:P:S 3:2:0
CIE: 50% Marks
Max. Marks: 100

Prerequisites if any	Tracing of Curve (Cartesian)
Learning objectives	The goal of the course Calculus, Differential Equations and Linear Algebra (24BMATE101) is to 1. Familiarize the importance of calculus associated with one variable and two variables 2. Analyze EEE, ECE problems applying ODE. 3. Apply the Knowledge of Linear Algebra to solve the system of equations.

Course Outcomes:

On the successful completion of the course, the student will be able to

Course Outcomes		Bloom's level
CO1	Compute the radius of curvature and apply the concept of partial differentiation to compute rate of change of multivariate functions.	Understand Apply Analyze
CO2	Analyze the solution of linear and non-linear ordinary differential equations and use the concept of multiple integrals to compute area & volume of solids.	
CO3	Compute the dimension of four fundamental subspaces & hence find the complete solution of system of equations.	
CO4	Develop familiarity with modern mathematical tools namely SCILAB/PYTHON/MATLAB and stimulates creative problem solving through experiential learning.	

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-

Strong: 3 Medium: 2 Low: 1

**Course Content**

	Module – 1 Calculus	No. of Lecture Hours	No. of Tutorial Hours	Self-Learning Hours
1.1	Introduction to polar coordinates and curvature relating to EC & EE Engineering applications. Polar coordinates, Polar curves, angle between the radius vector and tangent, angle between two curves. Pedal equations.	3	1	-
1.2	Curvature and Radius of curvature - Cartesian and Pedal forms. Problems.	3	1	-
1.3	Application: Communication signal.	1	1	-
	Module – 2 Series Expansion and Multi Variable Calculus			-
2.1	Introduction of series expansion and partial differentiation in EC & EE Engineering applications. Taylor's series expansion for one variable (Statement only)–problems. Indeterminate forms - L'Hospital's rule-problems.	3	1	-
2.2	Partial differentiation, total derivative-differentiation of composite functions, Jacobian and problems. Maxima and minima for a function of two variables. Problems, Taylor's series expansion for function of two variables.	4	1	-
2.3	Applications: Lagrange's method for extreme values of a function.	2	1	-
	Module – 3 Ordinary Differential Equations of First Order			
3.1	Introduction to first order ordinary differential equations pertaining to the applications for EC & EE engineering. Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations-Applications of ODE's -Orthogonal trajectories - problems.	3	1	-
3.2	Non-linear differential equations: Introduction to general and singular solutions, Solvable for p only, Clairaut's equations - Problems.	2	1	-
3.3	Applications of ordinary differential equations: L-R and L-C-Rcircuits.	2	1	-
	Module –4 Integral Calculus			
4.1	Introduction to Integral Calculus in EC&EE engineering applications. Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals over a region, area and by change of order of integration, changing into polar coordinates - Problems.	3	1	-
4.2	Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions. Problems.	3	1	-
4.3	Applications: Applications to find area and volume.	2	1	-
	Module –5 Linear Algebra			
5.1	Introduction of liner algebra related to computer science & engineering. Elementary row transformation of a matrix, Rank of a matrix.	2	2	-
5.2	Vector spaces: subspace, null space, solving $Ax=0$ & $Rx =0$, the complete solution to $Ax=b$,	2		-
5.3	Linearly independent and dependent sets, linear span, Basis & Dimension,	2	1	-
5.4	Dimension of four fundamental Subspaces.	2		-
5.5	Applications: Network Analysis.	1		-
Total No. of Lecture Hours		40		
			Total No. of Tutorial Hours	15
			Total No. of Self learning Hours	0

**Detailed Lesson Plan:**

Sr No. of Module	Number of related learning Objectives	Weeks/ Dates	Online Mode		ICT Tool/ Platform/ LMS	Face-to-face Mode	
			Resource (OER/ URL/ IM/ CP)	Activity (Describe activity in detail)		Resource (OER/ URL/ IM/ CP)	Activity
1.1	1	1	https://youtu.be/WsQQvHm4lSw?si=56HCclFGrDOOQ6P3C	-	Smart board, Moodle	-	Group Discussion & Presentation
1.2	1	2		-			
1.3	1	3		-			
2.1	1	3		-			
2.2	1	4		-			
2.3	1	5		-			
3.1	2	6		-			
3.2	2	7		-			
3.3	2	7		-			
4.1	1	8		-			
4.2	1	9		-			
4.3	1	10		-			
5.1	3	11		-			
5.2	3	11		-			
5.3	3	12		-			
5.4	3	13	-				
5.5	3	14	-				

Assessment Pattern:

Bloom's level	Continuous Internal Examination			End Semester Examination
	Test 1	Test 2	Assignment/Quiz/AAT	
Remember	✓	✓	✓	✓
Understand	✓	✓	✓	✓
Apply	✓	✓	✓	✓
Analyze	✓	✓		✓
Evaluate	✓	✓		✓
Create				

**List of topics for Experiential learning****(Assignment/Presentation/Models/Simulations with modern mathematical tools namely SCILAB/PYTHON/MATLAB)**

1	Finding partial derivatives, Jacobian and plotting the graph
2	Applications to Maxima and Minima of two variables
3	Solution of first order differential equation and plotting the graphs
4	Program to compute area, volume and centers of gravity
5	Evaluation of improper integrals
6	Test for consistency of system of linear non homogeneous equations and graphical representation.
7	Computation of basis, dimension of four fundamental subspaces of a vector space.

Self-learning topics identified: (Maximum of 5 topics)

1. Center and circle of curvature
2. Euler's Theorem and problems, Maclaurin's series expansion.
3. Solvable for x and y.
4. Volume by triple integration, Center of gravity.
5. Solution of system of equations by Gauss-Jacobi iterative method.

Textbooks:

1. **B.S.Grewal**: "Higher Engineering Mathematics", Khanna publishers, 44thEd. 2021.
2. **E.Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.

Reference Books:

1. **V. Ramana**: "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
2. **Srimanta Pal & Subodh C. Bhunia**: "Engineering Mathematics" Oxford University Press, 3rd Ed., 2016.
3. **Tom Apostol** "Calculus: One variable calculus with an introduction to Linear Algebra", Vol. 1, Wiley publications, 2nd edition, 2007.
4. **Tom Apostol** "Calculus: Multi-Variable Calculus and Linear Algebra with applications to differential equations And Probability, Vol.2, Wiley publications, 2nd edition, 2007.

Online Resources:

1. <https://www.youtube.com/watch?v=ixDGaEqWuA0>.
2. https://www.youtube.com/results?search_query=npTEL+linear+algebra