VECTOR CALCULUS & TRANSFORM TECHNIQUES
(Common to ECE and EEE)

23MA1104 **Credits:3**

Instruction : 3 periods & 1 Tutorial/Week Sessional Marks:40
End Exam : 3 Hours End Exam Marks:60

Prerequisites: Differentiation, integration and functions.

Course Objectives:
The aim of this course is to introduce basic fundamentals of vector calculus, and study of Fourier and Z-transforms and its applications.

Course Outcomes: At the end of the course, students will be able to

1.	Examine, analyze and compare probability distributions**.**
2.	Identify different Fourier transforms of non-periodic functions and also use them to evaluate boundary value problems.
3.	Explain the characteristics and properties of Z-transforms.
4.	Explain the characteristics of scalar and vector valued functions and provide a physical interpretation of the gradient, divergence, curl and related concepts.
5.	Transform line integral to surface integral, surface to volume integral and vice versa using Green's theorem, Stoke's theorem and Gauss's divergence theorem.

CO-PO –PSO Mapping:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2										1			
CO2	3	2										1			
CO3	3	2										1			
CO4	3	2										1			
CO5	3	2										1			

Correlation levels 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping of Course Outcomes with Program Outcomes &Program Specific Outcomes:

CO-PO-PSO Justification	
1	CO1 deals with knowledge of probability distributions and is widely used in many areas of engineering.
2	CO2 deals with properties of Fourier transforms, and their applications, these are widely used in various field of engineering.
3	CO3 deals with the properties and applications of Z-transforms, there are used to analyze process digital data in various filed of electrical engineering.
4	CO4 deals with finding the gradient, div and curl of a given vector point functions and these fundamental concepts in vector calculus are widely used in many areas of engineering.
5	CO5 deals with vector integration like line, surface and volume integrals and these are widely used in various fields of engineering.

SYLLABUS

UNIT I **10 Periods**

PROBABILITY AND DISTRIBUTIONS

Introduction – Basic terminology – Probability and set notations – Addition law of probability – Independent events – Baye's theorem – Random variable – Discrete probability distribution: Binomial distribution and Poisson distribution – Continuous probability distributions: Normal distribution (mean , variance , standard deviation and their properties without proofs).

UNIT II **10 Periods**

FOURIER TRANSFORMS

Introduction – Definition – Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Fourier transforms – Properties of Fourier transforms – Convolution theorem – Parseval's identity for Fourier transforms – Relation between Fourier and Laplace transforms – Fourier transforms of the derivatives of a function – Applications of transforms to boundary value problems.

UNIT III **10 Periods**

Z-TRANSFORMS

Introduction – Definition - Some standard Z-transforms – Linearity property – Damping rule – Some standard results – Shifting U_n to the right/left – Multiplication by n – Two basic theorems (Initial value theorem and Final value theorem) – Convolution theorem.

Evaluation of inverse Z - transforms – Applications to difference equations.

UNIT IV **10 Periods**

VECTOR DIFFERENTIATION

Scalar and vector point functions – Del applied to scalar point functions – Directional derivative – Del applied to vector point functions – Physical interpretation of divergence and curl – Del applied twice to point functions – Del applied to products of point functions.

UNIT V **10 Periods**

VECTOR INTEGRATION

Integration of vectors – Line integral , circulation, work done – Surface integral , flux – Green's theorem in the plane – Stoke's theorem – Volume integral – Gauss divergence theorem (all theorems without proofs) – Irrotational and solenoidal fields.

TEXT BOOKS:

B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

2. N. P. Bali, Engineering Mathematics, Lakshmi Publications.

3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas, Calculus, 13/e, Pearson Publishers, 2013.

4. H. K. Dass, Advanced Engineering Mathematics, S. Chand and complany Pvt. Ltd.

5. Michael Greenberg, Advanced Engineering Mathematics, Pearson, Second Edition.

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