गति शक्ति विश्वविद्यालय
GATI SHAKTI VISHWAVIDYALAYA
A Central University under the Ministry of Railways,
Government of India Lalbaug, Vadodara, Gujarat
www.nrti.edu.in | 0265-2648305

NAME OF COURSE: ENGINEERING MATHEMATICS I

COURSE DETAILS

Course Credits: 4 **Course Type:** Core **Semester:** First

Duration : August 2023-24

Programme : **B. Tech. in**

- Artificial Intelligence and Data Science (Specialization: Transportation and Logistics)
- Civil Engineering (Specialization: Rail Engineering)
- Electronics and Communication Engineering (Specialization: Rail Engineering)
- Electrical Engineering (Specialization: Rail Engineering)
- Mechanical Engineering (Specialization: Rail Engineering)

COURSE ADMINISTRATION:

Faculty: : **Dr Navneet Lal Sharma and Dr. Pradeep Kumar Saroj**

Affiliation : **Assistant Professor, GSV Vadodara**

Email : nlsharma@gsv.ac.in & pk.saroj@gsc.ac.in

INTRODUCTION

The objective of this course is to familiarize the graduate engineers with techniques in differential calculus, integral calculus, vector calculus, matrices and complex analysis. It aims to equip the students with standard concepts and tools from intermediate to advanced level that will enable them to tackle more advanced level of mathematics and applications that they would find useful in their disciplines

LEARNING OBJECTIVES / OUTCOMES

Course Objectives:

- To recall and remember basics of matrices, complex numbers, and differential calculus.
- To develop basic understanding of matrices, complex numbers and differential calculus to various streams of engineering.
- To apply methods to solve engineering problems.

S. No	**Course Outcomes:**
CO-1	Apply differentiation and integration to solve applied problems in engineering and find the maxima and minima of functions
CO-2	Describe all of the concepts of integrals: Double and Triple integrals and evaluate the area and volume by using multiple integrals. Beta and Gama function to evaluate various types of integrals
CO-3	Understand the abstract concepts of matrices, system of linear equations and their solutions. Also, finding the eigenvalues and power of matrices

CO-4	Understand the abstract concepts of probability and statistics.
CO-5	Apply divergence and curl to solve problems involving line, surface and Volume integrals and its applications (Green, Stokes and Gauss Divergence theorems)
CO6	**Applications:** Differential calculus, integral calculus and matrices are useful in many branches of mathematics including engineering fields such as nuclear, aerospace, mechanical and electrical engineering, applied mathematics and physics.

COURSE STRUCTURE

A. Course Completion Plan

Assessment / Engagement	Quantity	Description	% of Total Marks
Mid Term Exam	25 (1 hr)	Offline / Online platform	-
Class attendance	-	-	-
Class Tests / Quizzes	02	Descriptive / Objective	30
Assignment-Continuous Evaluation	01	Descriptive	20
End term examination	01	Descriptive	50
		Total	**100**

B. Pedagogy:

- ✓ Offline / Online Lectures
- ✓ Offline / Online Queries
- ✓ Offline / Online Group Assignments
- ✓ Offline / Online Class Tests
- ✓ Offline / Online Quizzes
- ✓ Trimester end exam

C. COURSE SYLLABUS

Units Description	No. of lecture hours	Assgn. / Tests/ Paper
Module 1: Differential Calculus Differentiation- Extrema on an Interval-Rolle's Theorem and the Mean Value Theorem, Increasing and Decreasing functions and First Derivative Test-Second derivative test, Maxima and Minima, Partial Derivatives, Jacobian, Partial Derivatives using Jacobian, Maxima and Minima of functions of two variables, Taylor's and Maclaurin's series for one and two variables	**15**	Test 1
Module 2: Multiple Integrals: Double and Triple Integrals, Change of Order of Integration, Change of variables. Applications of integration to	**11**	Mid Term

areas and volumes. Beta and Gamma functions and their properties, evaluation of integrals using gamma and beta functions		
Module 3: Vector Calculus Scalar and Vector fields, Vector differentiation, Directional derivatives Gradient, Divergence and curl and their physical significance. Evaluation of Line, surface and volume integrals, Statements and problems based on the Greens theorem in plane, Stokes theorem and Gauss Divergence theorem (without proofs).	**11**	Assignment
Module 4: Matrices & Its Applications Review of basic concepts, Elementary transformations, Rank of matrix, Inverse of matrix, Consistency of linear simultaneous equations. Application of matrix: Eigen values and its properties, Eigen vectors. Statement and problems based on Cayley-Hamilton theorem and Diagonalization of a matrix and Linear Transformations.	**15**	Test 2
Module 5: Probability and Statistics: Probability: Basic concepts and definition, Axioms, Laws of probability, conditional probability, Bayes theorem and its applications. Introductory concepts: Population & Sample space, Mean, mode, Median, Standard deviation, coefficient of variation,	**08**	

Text Books:

1. B.S. Grewal, 'Higher engineering Mathematics', Khanna publishers, Delhi (43th edition), (2012).
2. B. V. Ramana, 'Higher Engineering Mathematics', Tata McGraw Hill Publications (2007)
3. N.P. Bali, Engineering Mathematics-I, II, III, Lakshmi Publication.

Reference Books:

1. C.R.Wylie, L.C. Barrette, 'Advanced Engineering Mathematics', McGraw Hill Publications, New Delhi.(6 th edition)(2003)
2. Erwin Kreyszig,'Advanced Engineering Mathematics' Wiley Eastern Ltd. (8th Student Edition) (2004).
3. Michael D. Greenberg, Advanced Engineering Mathematics, 2006, 2nd Edition, Pearson Education, Indian edition
4. Dennis Zill, A First Course in Differential Equations with Modelling Applications, 2018, 11th Edition, Cengage Publishers.