GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3110014
SUBJECT NAME: Mathematics-1
1st Year

Type of course: Basic Science Course

Prerequisite: Algebra, Trigonometry, Geometry

Rationale: The study of rate of changes, understanding to compute area, volume and express the function in terms of series, to apply matrix algebra**.**

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	2	0	5	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs	% Weightage
01	Indeterminate Forms and L'Hôspital's Rule.	01	15 %
	Improper Integrals, Convergence and divergence of the integrals, Beta and Gamma functions and their properties.	03	
	Applications of definite integral, Volume using cross-sections, Length of plane curves, Areas of Surfaces of Revolution	03	
02	Convergence and divergence of sequences, The Sandwich Theorem for Sequences, The Continuous Function Theorem for Sequences, Bounded Monotonic Sequences, Convergence and divergence of an infinite series, geometric series, telescoping series, □□□ term test for divergent series, Combining series, Harmonic Series, Integral test, The p - series, The Comparison test, The Limit Comparison test, Ratio test, Raabe's Test, Root test, Alternating series test, Absolute and Conditional convergence, Power series, Radius of convergence of a power series, Taylor and Maclaurin series.	08	20 %
03	Fourier Series of *2*□ periodic functions, Dirichlet's conditions for representation by a Fourier series, Orthogonality of the trigonometric system, Fourier Series of a function of period *2*□, Fourier Series of even and odd functions, Half range expansions.	04	10 %
04	Functions of several variables, Limits and continuity, Test for non existence of a limit, Partial differentiation, Mixed derivative theorem, differentiability, Chain rule, Implicit differentiation, Gradient, Directional derivative, tangent plane and normal line, total differentiation, Local extreme values, Method of Lagrange Multipliers.	08	20 %
05	Multiple integral, Double integral over Rectangles and general regions, double integrals as volumes, Change of order of integration, double integration in polar coordinates, Area by double integration, Triple integrals in rectangular, cylindrical and spherical coordinates, Jacobian, multiple integral by substitution.	08	20 %
06	Elementary row operations in Matrix, Row echelon and Reduced row echelon forms, Rank by echelon forms, Inverse by Gauss-Jordan method,	07	15%

	Solution of system of linear equations by Gauss elimination and Gauss-Jordan methods. Eigen values and eigen vectors, Cayley-Hamilton theorem, Diagonalization of a matrix.		

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	25	35	0	0	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy).

Reference Books:

(1) Maurice D. Weir, Joel Hass, Thomas' Calculus, Early Transcendentals, 13e, Pearson, 2014.
(2) Howard Anton, Irl Bivens, Stephens Davis, Calculus, 10e, Wiley, 2016.
(3) James Stewart, Calculus: Early Transcendentals with Course Mate, 7e, Cengage, 2012.
(4) Anton and Rorres, Elementary Linear Algebra, Applications version,, Wiley India Edition.
(5) T. M. Apostol, Calculus, Volumes 1 & 2,, Wiley Eastern.
(6) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Edition.
(7) Peter O'Neill, Advanced Engineering Mathematics, 7th Edition, Cengage.

Course Outcomes

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and matrices. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Sr. No.	Course Outcomes	Weightage in %
1	To apply differential and integral calculus to improper integrals and to determine applications of definite integral. Apart from some other applications they will have a basic understanding of indeterminate forms, Beta and Gamma functions.	15
2	To apply the various tests of convergence to sequence, series and the tool of power series and fourier series for learning advanced Engineering Mathematics.	30
3	To compute directional derivative, maximum or minimum rate of change and optimum value of functions of several variables.	20
4	To compute the areas and volumes using multiple integral techniques.	20
5	To perform matrix computation in a comprehensive manner.	15

List of Open Source Software/learning website:

Scilab, MIT Opencourseware.