GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Degree

Branch: All

Course / Subject Code : BE01000041

Course / Subject Name : Mathematics – 1

w. e. f. Academic Year:	2024-25
Semester:	Ist semester
Category of the Course:	BSC

Prerequisite:	Basic Algebra, Geometry, Trigonometry and Calculus
Rationale:	The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	To apply differential and integral calculus to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.	A
02	The fallouts of Taylor's and Maclaurin's Theorem that is fundamental to application of analysis to Engineering problems.	A
03	The tool of Sequences and Infinite series for learning advanced Engineering Mathematics.	A
04	To deal with functions of several variables that is essential in most branches of engineering.	A
05	To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.	A

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	1	0	4	70	30	0	0	100

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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Module 1: Basic Calculus:** Evaluation of improper integrals of Type-I and Type-II, Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions	9	20%
2.	**Module 2: Single-variable Calculus (Differentiation):** Taylor's and Maclaurin's theorem for a function of one variable, Taylor's and Maclaurin's series of a function using statement of the theorems; Extreme values of functions; Indeterminate forms and L' Hospital's rule.	9	20%
3.	**Module 3: Sequences and series:** Sequence of numbers and its convergence, Infinite series; Tests for convergence (Telescoping series, Geometric series test, Integral test, p-test, comparison test, D' Alembert's ratio test, Cauchy's root test), Alternating series test; Power series, Radius and interval of convergence, Conditional and Absolute convergence of a power series	9	20%
4.	**Module 4: Multivariable Calculus (Differentiation):** Limit, Continuity and Differentiation for function of two or more variables, total derivative, gradient, directional derivatives; Tangent plane and Normal line to the surface $f(x, y, z) = c$; Extreme values for function of two variables (Maxima, minima and saddle points); Method of Lagrange multipliers.	9	20%
5.	**Module 5: Multivariable Calculus (Integration):** Multiple Integration: Double integrals (Cartesian, Polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian, Cylindrical, Spherical).	9	20%
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	35	15	0	0	0

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
4. AICTE's Prescribed Textbook: Mathematics-I (Calculus & Linear Algebra), Khanna Book Publishing Co.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

(b) Open source software and website:

1. MIT Open Courseware (https://ocw.mit.edu/search/?s=department_course_numbers.sort_coursenum)
2. NPTEL Open Courseware (https://nptel.ac.in/)

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