GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Degree

Branch: All

Course / Subject Code : BE02000011

Course / Subject Name : Mathematics – 2

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	BSC

Prerequisite:	Basic Algebra, Complex Algebra, Calculus.
Rationale:	Mathematics fundamental necessary to formulate, solve and analyze engineering problems. Complex analysis not only provides insight into mathematical theory but also has practical applications in engineering, physics and many other forms.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	The essential tool of matrices and linear algebra in a comprehensive manner.	A
02	The effective mathematical tools for the solutions of differential equations that model physical processes.	A
03	The tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing engineering problems.	A
04	To find Laurent's series, poles. residues, and apply Cauchy Residue theorem in evaluating some real integrals.	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

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Module 1: Matrices:** Linear Independence; Row Echelon form (REF)and Reduced Row Echelon form(RREF) of a Matrix, Rank of a Matrix using REF/RREF; Inverse of a matrix using Gauss-Jordan method; Solution of System of linear equations by elementary row operations; Symmetric, skew-symmetric and orthogonal matrices; Eigen values and eigenvectors; Diagonalization of matrices; Inverse of a Matrix by Cayley-Hamilton Theorem.	10	22%
2.	**Module 2: First order ordinary differential equations:** Exact differential equations, Integrating factors for non-Exact differential equations, linear and Bernoulli's equations. Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.	8	18%
3.	**Module 3: Ordinary differential equations of higher orders:** Higher order linear differential equations with constant and variable coefficients, Euler-Cauchy equations, solution by variation of parameters, method of undetermined coefficients; Classification of Ordinary and Singular points, Power series solutions for ordinary points.	10	22%
4.	**Module 4: Complex Variables (Differentiation):** Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; analyticity of elementary functions (exponential, trigonometric, logarithm) and their properties;	9	20%
5.	**Module 5: Complex Variables (Integration):** Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy residue theorem (without proof), Rouche's theorem.	8	18%
	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. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2006.
2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.
8. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
9. Howard Anton, Irl Bivens, Stephens Davis, Calculus, 10e, Wiley, 2016.
10. AICTE's Prescribed Textbook: Mathematics-II (Calculus, Ordinary Differential Equations and Complex Variable), Khanna Book Publishing Co.

(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/)

* * * * * * *