GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3110015
SUBJECT NAME: Mathematics-2
1st Year

Type of course: Basic Science Course

Prerequisite: Calculus, fourier series

Rationale: To compute line integrals, solution techniques of higher order ordinary differential equations, fourier integral representation**.**

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

Sr. No.	Content	Total Hrs	% Weightage
01	Vector Calculus: Parametrization of curves, Arc length of curve in space, Line Integrals, Vector fields and applications as Work, Circulation and Flux, Path independence, potential function, piecewise smooth, connected domain, simply connected domain, fundamental theorem of line integrals, Conservative fields, component test for conservative fields, exact differential forms, Div, Curl, Green's theorem in the plane (without proof).	14	33 %
02	Laplace Transform and inverse Laplace transform, Linearity, First Shifting Theorem (s-Shifting), Transforms of Derivatives and Integrals, ODEs, Unit Step Function (Heaviside Function), Second Shifting Theorem (t-Shifting), Laplace transform of periodic functions, Short Impulses, Dirac's Delta Function, Convolution, Integral Equations, Differentiation and Integration of Transforms, ODEs with Variable Coefficients, Systems of ODEs.	07	22 %
03	Fourier Integral, Fourier Cosine Integral and Fourier Sine Integral.	02	
04	First order ordinary differential equations, Exact, 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.	05	12 %
05	Ordinary differential equations of higher orders, Homogeneous Linear ODEs of Higher Order, Homogeneous Linear ODEs with Constant Coefficients, Euler–Cauchy Equations, Existence and Uniqueness of Solutions, Linear Dependence and Independence of Solutions, Wronskian, Nonhomogeneous ODEs, Method of Undetermined Coefficients, Solution by Variation of Parameters.	08	20 %
06	Series Solutions of ODEs, Special Functions, Power Series Method, Legendre's Equation, Legendre Polynomials, Frobenius Method, Bessel's Equation, Bessel functions of the first kind and their properties.	06	13%

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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) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley and Sons.
(2) Peter O'Neill, Advanced Engineering Mathematics, 7th Edition, Cengage.
(3) Dennis G. Zill, 4th edition, Advanced Engineering Mathematics, 4th Edition, Jones and Bartlett Publishers.
(4) Maurice D. Weir, Joel Hass, Thomas' Calculus, Early Transcendentals, 13e, Pearson, 2014.
(5) Howard Anton, Irl Bivens, Stephens Davis, Calculus, 10e, Wiley, 2016.

Course Outcomes:

The objective of this course is to familiarize the prospective engineers with techniques in vector calculus, ordinary differential equations, fourier integrals and laplace transform. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Sr. No.	Course Outcomes	Weightage in %
1	To apply mathematical tools needed in evaluating vector calculus and their usage like Work, Circulation and Flux.	33
2	To apply the laplace transform as tools which are used to solve differential equations and fourier integral representation.	22
3	To apply effective mathematical tools for the solutions of first order ordinary differential equations.	12
4	To apply effective mathematical methods for the solutions of higher order ordinary differential equations.	20
5	To use series solution methods and special functions like Bessels' functions.	13

List of Open Source Software/learning website:

Scilab, MIT Opencourseware.