



**Sarvajani University**  
**Sarvajani College of Engineering & Technology,**  
**Surat**  
**Bachelor of Technology (B. Tech.)**



**B. Tech. Semester II**

**Subject Name: Mathematics - 2**

**Subject Code: BTAS11104**

**Type of course:** Basic Science

**Prerequisite:** Calculus

**Rationale:** To compute line integrals, solution techniques of higher order ordinary differential equations, Laplace transforms.

**Teaching and Examination Scheme:**

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	1	0	4	60	25	15	0	0	100

**CA1:** Continuous Assessment (assignments/projects/open book tests/closed book tests) **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

**Content:**

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	<b>Multiple integrals:</b> 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 multiple integral by substitution.	08	20 %
2.	<b>Vector Calculus:</b> Gradient, Directional derivative, divergence, curl of a vector and their properties, conservative vector field and scalar potential function, Line Integrals and its applications as Work, Circulation and Flux, Path independence, Conservative fields, Surface Integrals, Volume Integrals, Theorems of Green, Gauss and Stokes (without proof).	10	20 %



Sr. No.	Topics	Teaching Hrs.	Module Weightage
3.	<b>Fourier Series:</b> Fourier Series of periodic functions of period $2\pi$ , Dirichlet's conditions for representation of a function by a Fourier series, Orthogonality of the trigonometric system, Fourier Series of a function of period $2l$ , Fourier Series of even and odd functions, Half range expansions Fourier Integral, Fourier Cosine Integral and Fourier Sine Integral.	08	20 %
4.	<b>Higher orders ordinary differential equations:</b> Homogeneous Linear ODEs of Higher Order, Existence and Uniqueness of Solutions, Linear Dependence and Independence of Solutions, Wronskian, Homogeneous Linear ODEs with Constant Coefficients, Non homogeneous ODEs, Solution by inverse operator, Euler–Cauchy Equations, Solution by Variation of Parameters Method.	09	20 %
5.	<b>Laplace Transform and inverse Laplace transform:</b> Linearity, First Shifting Theorem (s-Shifting), Transforms of Derivatives and Integrals, Differentiation and Integration of Transforms, Unit Step Function (Heaviside Function), Second Shifting Theorem (t-Shifting), Laplace transform of periodic functions, Short Impulses, Dirac's Delta Function, Convolution Theorem, Solution ODEs using Laplace transform	10	20 %

**Suggested Specification Table of Marks with Bloom's Taxonomy (Theory/Practical):**

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	40	40	0	0	0

**Legends:** R: Remembrance, U: Understanding; A: Application, N: Analyze, E: Evaluate C: Create and above Levels

**Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

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Reference Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Calculus and Analytic geometry	G. B. Thomas and R. L. Finney	Pearson/ISBN: 9788174906168	Reprint, 2002	9 <sup>th</sup>
2.	Advanced Engineering Mathematics	Erwin Kreyszig	Wiley India/ISBN: 9781118049273	2010	10 <sup>th</sup>
3.	Advanced Engineering Mathematics	Dennis G. Zill, Warren S. Wright	Jones and Bartlett Publishers, ISBN: 9780763779665	2011	4 <sup>th</sup>
4.	Thomas' Calculus, Early Transcendental	Maurice D. Weir, Joel R. Hass	Pearson/ ISBN : 9780321884077	2014	13 <sup>th</sup>
5.	Calculus	Howard Anton, IrlBivens, Stephens Davis	Wiley/ ISBN : 9781118404003	2016	10 <sup>th</sup>
6.	Elementary Differential Equations and Boundary Value Problems	W.E. Boyce and R. C. DiPrima	Wiley India/ ISBN: 9788126521555	2009	9 <sup>th</sup>
7.	A text book of Engineering Mathematics	N.P. Bali and Manish Goyal	Laxmi Publications/ ISBN: 9788170089926	2007(Reprint: 2008,2009, 2010)	7 <sup>th</sup>
8.	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers/ ISBN:8174091157	2010	36 <sup>th</sup>

**Course Outcome:**

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	use mathematical tools required in evaluating multiple integrals ( <i>R,U,A-Cognitive level</i> )	20
CO-2	extend the usage of multiple integrals in vector calculus, recognize conservative vector field and identify its potential. ( <i>R,U,A-Cognitive level</i> )	20
CO-3	identify existence of Fourier series expansion of given functions, calculate Fourier series and Fourier Integrals of continuous and discontinuous functions and interpret their values in finite and infinite domain. ( <i>R, U, A-Cognitive level</i> )	20
CO-4	demonstrate mathematical model, identify appropriate methods to solve higher order ordinary differential equations, recognize different alternates, calculate optimal solution(s) and interpret the results of the real-world problems. ( <i>R,U,A-Cognitive level</i> )	20
CO-5	find Laplace transforms, solve initial value problems and correlate with the physical problems. ( <i>R,U,A-Cognitive level</i> )	20

**Mapping with POs:**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	3	3	3	2	-	-	-	-	-	-	-			
CO-2	3	3	3	3	3	-	-	-	-	-	-	1			
CO-3	3	3	3	3	2	-	-	-	-	-	-	2			
CO-4	3	3	3	3	3	-	-	-	-	-	-	1			
CO-5	3	3	3	3	2	-	-	-	-	-	-	-			
Rationale*	15	15	15	15	12	-	-	-	-	-	-	4			

**\*Rationale:** All CO's are compatible and matching to the derived POs to several extents. Mathematical techniques and its applications help to analyse the real-world problems through science and technology viewpoints. From this, new ideas can be executed for the modification of existing systems for better outcomes, which satisfy and further justify the programme's outcomes.



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**List of Open Source learning website: NPTEL**

- <https://nptel.ac.in/courses/111/105/111105121/>
  - It covers major topics of the syllabus.
- <https://nptel.ac.in/courses/111/105/111105134/>
  - It covers major topics of the syllabus.

**List of Open Software: Nil**

