

First Year B. Tech. (Semester II) - Working Professional

Course Name: Engineering Mathematics

Course Code: BTAS11282

Type of course: Basic Science Course (BSC)

Prerequisite: Basic Mathematics

Rationale: To equip students with essential mathematical tools and techniques that are fundamental for solving complex engineering problems across various disciplines. These mathematical concepts enable engineers to model, analyze, and optimize systems, whether in structural design, electrical circuit analysis, data processing, or system control.

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks		Practical Marks		Total
L	T	P	C	TEE	CAT	TEP	CA3	
3	1	0	4	60	40	00	00	100

CAT: Continuous Assessment (assignments/projects/open book tests/closed book tests 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) CAP: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Course Content:

Sr. No.	Topics	Total Hours	% Weightage
1.	Differentiation: Differentiation, Derivative Rules, derivative of some standard functions, derivative of composite functions, chain rule, derivatives of trigonometric & inverse trigonometric functions, derivative of implicit function. Concept of exponential and logarithmic functions and their derivatives. Derivative of functions expressed in parametric forms. Second order derivatives.	8	20
2.	Integration: Anti-Differentiation, Indefinite Integral, Power Formula, Trigonometric Functions, Logarithmic Function, Exponential Function, Inverse Trigonometric Functions, Definite Integral, Integration by Parts, Trigonometric Integrals, Trigonometric Substitution, Rational Functions.	8	20
3.	Matrices, Determinant and system of linear equations: Matrices and determinants: Concept, notation, order, Basic	8	20

	algebraic operations (equality, Addition, multiplication and scalar multiplication of matrices) ,types of matrices, zero matrix, transpose of a matrix, symmetric and skew symmetric matrices. Commutativity of multiplication of matrices. Determinant of a square matrix (up to 3×3 matrices), properties of determinants, minors, cofactors, adjoint and inverse of a square matrix. Introduction to system of linear equations. Method of solutions.		
4.	Introduction to Statistics: Collection of data, presentation of data – tabular form, ungrouped/grouped, Graphical representation of data: bar graphs, histograms, frequency polygons, pie chart, Cumulative frequency graph. Mean, median, mode of ungrouped data and grouped data.	8	20
5.	Introduction to Probability: Outcomes, sample spaces, Events, Occurrence of events, exhaustive events, mutually exclusive events. Axiomatic of probability, Probability of an event, Multiplication theorem on probability. Concept of with replacement and without replacement, Conditional probability, independent events.	10	20

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	05	05	20	0

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

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.

Reference Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Advanced Engineering Mathematics	Erwin Kreyszig	Wiley India/ISBN: 9781118049273	2010	10 th
2.	Thomas' Calculus, Early	Maurice D. Weir, Joel R.	Pearson/ ISBN: 9780321884077	2014	13 th

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
	Transcendentals	Hass			
3.	A text book of Engineering Mathematics	N.P. Bali and Manish Goyal	Laxmi Publications/ ISBN: 9788170089926	2007(Reprint: 2008,2009, 2010)	7 th
4.	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers/ ISBN:8174091157	2010	36 th

Course Outcome:

Sr. No.	CO Statement	Weightage in %
CO-1	Utilizing differentiation and derivative rules to analyze and solve problems in motion, optimization, electrical circuits, signal processing, control systems, and fluid dynamics, including computing rates of change, analyzing system behavior, and determining maxima and minima for design optimization.	20
CO-2	Applying integration techniques such to solve engineering problems in various areas.	20
CO-3	Applying matrices, determinants, and systems of linear equations to solve practical problems in areas such as data transformations, algorithm development, structural analysis, finite element methods, network analysis, circuit theory, and control systems.	20
CO-4	Mastering data collection, presentation, and graphical representation techniques, and calculating measures of central tendency for both ungrouped and grouped data to analyze and interpret engineering data for decision-making, quality control, and optimization.	20
CO-5	Understanding the fundamentals of probability, to analyze uncertainties in engineering systems, reliability analysis, and decision-making processes.	20

List of Open Source learning website: MIT Open courseware, NPTEL