Faculty of Engineering & Technology
Bachelor of Technology (B. Tech)
(W. E. F.: 2023-24)

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Name of Faculty	:	Faculty of Engineering & Technology
Name of Program	:	Bachelor of Technology (B. Tech)
Course Code	:	2BHE01
Course Title	:	Higher Engineering Mathematics
Type of Course	:	Basic Science (BS)
Year of Introduction	:	2023-24

Prerequisite	:	Basic knowledge of Calculus
Course Objective	:	Different Techniques to solve higher order ODEs, Direction and magnitude studies ,PDEs
Course Outcomes	:	At the end of this course, students will be able to:
	CO1	To calculate line integral , use of grad, div and curl, green and stock's theorem
	CO2	Apply different techniques to solve higher order ODEs
	CO3	Understand the rate of change when more than one independent variables present, apply partial derivative equation techniques to predict the behaviour of certain phenomena.
	CO4	To represent Fourier series and integral of periodic function
	CO5	To solve initial-value problems for linear differential equations with constant coefficients.

Teaching and Examination Scheme

Teaching Scheme (Contact Hours)			Credits	Examination Marks				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	SEE	CIA	SEE	CIA	
3	0	0	3	70	30	0	0	100

Legends: ***L****-Lecture;* ***T****–Tutorial/Teacher Guided Theory Practice;* ***P****–Practical,****C*** *– Credit,* ***SEE*** *– Semester End Examination,* ***CIA*** *- Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.))*

Course Content

Unit No.	Topics	Teaching Hours	Weightage	Mapping with CO
1	**Vector Calculus** Vector space and subspace, Linearly dependent and independent set, Basis and dimension ,Gradient , divergence and curl ,Directional derivative , Ir-rotational and Solenoidal vector fields, Line integration , Green's theorem, Gauss divergence theorem and Stoke's theorem	10	22%	CO1
2	**Higher order differential equation** Homogenous Linear ODEs with constant coefficient ,Euler- Cauchy equations, Wronskian , Non homogenous ODEs , Method of undetermined coefficient , solution by variation of parameter.	10	22%	CO2
3	**Partial differential equation** First order partial differential equation and it's solution Euler's theorem, Total derivatives, Jacobians, Maxima and Minima of two variables using Lagrange's multipliers.	10	22%	CO3
4	**Fourier Series and Fourier Integral** Fourier Series of periodic function, Fourier integral of cosine and sine function.	7	14%	CO4
5	**Laplace Transform** Laplace transforms – Laplace transform of derivatives and integrals – shifting theorem – differentiation and integration of transforms – inverse transforms – application of convolution property – solution of linear differential equations with constant coefficients using Laplace transform – Laplace transform of unit step function, impulse function and periodic function.	8	20%	CO5

Suggested Distribution of Theory Marks Using Bloom's Taxonomy						
Level	Remembrance	Understanding	Application	Analyse	Evaluate	Create
Weightage	**20**	**35**	**20**	**10**	**10**	**5**

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

Suggested List of Experiments/Tutorials

Sr. No.	Name of Experiment/Tutorial	Teaching Hours
1	Linearly dependent and independent set, Basis and dimension, Gradient, divergence and curl, Directional derivative	2
2	Line integration, Green's theorem, Gauss divergence theorem and Stoke's theorem	2
3	Homogenous Linear ODEs with constant coefficient, Euler- Cauchy equations, Wronskian	2
4	Non-homogenous ODEs, Method of undetermined coefficient, solution by variation of parameter	2
5	First order partial differential equation and it's solution, Euler's theorem, Total derivatives	2
6	Jacobeans', Maxima and Minima of two variables using Lagrange's multipliers.	2
7	Fourier Series of periodic function	2
8	Fourier integral of cosine and sine function.	2
9	Laplace transform of derivatives and integrals – shifting theorem – differentiation and integration of transforms	2
10	Inverse transforms – application of convolution property – solution of linear differential equations with constant coefficients using Laplace transform – Laplace transform of unit step function, impulse function and periodic function	2

Suggested Learning Websites

Sr. No.	Name of Website
1	https://semesters.in/engineering-mathematics-for-btech-first-year/
2	https://www.nptel.ac.in
3	https://tutorial.math.lamar.edu/classes/calci/calci.aspx
4	https://www.khanacademy.com

Reference Books

Sr. No.	Name of Reference Books
1	Erwin Kreyszig, Advanced Engineering mathematics, John Wiley, 10th Ed., 2015.
2	B. S Grewal, Higher Engineering Mathematics, (43rd Edition), Khanna Pub., Delhi (2014).
3	B V Ramana, Higher Engineering Mathematics; McGraw-Hill
4	R. K. Jain and S. R. K. Iyernagar, Advanced Engineering Mathematics, Alpha Science, 3rd Ed., 2007.