

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	Advanced Engineering Mathematics
Course Code:	1ET1000301
Pre-requisite Course:	Calculus, Linear Algebra

Course Objectives:

1. To understand the applications of Laplace transform.
2. Able to understand Fourier series and Fourier integral.
3. Create and analyses mathematical models using first and higher order differential equations to solve application problems such as electrical circuits, orthogonal trajectories.
4. To develop mathematical skill so that students are able to apply mathematical methods & principals in solving problem from engineering fields.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								
Lecture	Tutorial	Practical	Credit	Theory				Practical				Total
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	2	-	5	28	70	12	30	-	-	-	-	100

Course Contents:

Sr. No.	Topic	Total Hours	Weightage (%)
1	Fourier Series and Fourier Integral: Periodic function, Trigonometric series, Fourier series, Functions of any period, Even and odd functions, Half-range Expansion, Applications: Forced oscillations, Fourier integral and its applications, Harmonic Analysis	08	20
2	Laplace Transforms and Applications: Definition of the Laplace transform, Linearity, First Shifting theorem, Inverse Laplace transforms, Transforms of derivatives and integrals, Differentiation and integration of transforms, Convolution theorem and, Evaluation of integrals by Laplace transform, Laplace Transform of Periodic Functions, Unit Step Function, Dirac Delta Function, Second Shifting Theorem, Applications to Ordinary Differential Equations.	10	20
3	Ordinary Differential Equations and Applications: First order differential equations: Revision, Exact differential equations, Bernoulli equations, Higher Order Ordinary Differential Equations: Differential Operator D, Inverse Operator $1/D$, Symbolic Form, Solution of ODE, Complimentary Function, Particular Integral, Linear differential equations of higher order, Homogeneous linear differential equations, Wronskian, Euler-Cauchy Equations, Legendre's Differential Equation, Non homogeneous equations, Solution by undetermined coefficient, Solution by variation of parameters, Applications: Orthogonal Trajectories of Curves, Modeling of LCR Circuits, Free Oscillations.	12	30

4	Partial Differential Equations (PDEs) and their Applications: Formation of PDEs, Solution of PDEs, Lagrange's PDE, First order Non-Linear PDEs, Equations reducible to Linear, Charpit's method, Homogeneous Linear PDE with Constant coefficients, Classification of PDEs, Separation of Variables: Solution of Heat, Laplace and Wave Equations.	10	25
5	Series Solution of Ordinary Differential Equations: Classification of Singularities, Solution by Power series method.	2	5

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

Reference Books:

1. Erwin Kreyszig: Advanced Engineering Mathematics, 8th Ed., John Wiley & Sons, India, 1999.
2. Greenberg M D: Advanced Engineering Mathematics, 2nd ed., Pearson Education.
3. W. E. Boyce and R. DiPrima, Elementary Differential Equations (8th Edition), John Wiley (2005).
4. Elements of Partial Differential Equations by Ian. N. Sneddon.
5. Integral Transforms by M.D. Raisinghania.

List of Open Source Software/learning website:

- <https://tutorial.math.lamar.edu>
- <https://www.frontiersin.org>
- <https://onlinecourses.nptel.ac.in>

LAB/Practical- NA

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Express the given function as Fourier series over the given interval.	2 Understanding, 3 Applying
CLO2	Find the Laplace transform of Mathematical functions (Constant, Exponential, Trigonometric, Polynomial functions).	1 Remembering 2 Understanding
CLO3	Evaluate Laplace transforms of given functions and use it to solve linear differential equations.	2 Understanding, 3 Applying
CLO4	Solve linear differential equations with constants coefficients and apply them to realistic problems.	3 Applying, 4 Analyze
CLO5	Explains the meaning of solution of a partial differential equation. Able to solves the linear partial differential equations with constant coefficients.	2 Understanding 3 Applying
CLO6	Use of power series in engineering problems.	2 Understanding 3 Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	M														
CLO2	H	L	M													
CLO3	H		H													
CLO4	M	M	H													
CLO5	H		M													
CLO6	M	M	H													

H: High, M: Medium, L: Low