20MA209T					Mathematics – III: Automobile Engineering					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs. / Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

- To apply Fourier analysis for solving applications in mechanical and other engineering branches.
- To familiarize students with a variety of engineering problems where analytical method fails and special function comes to rescue.
- To get analytical solutions to partial differential equations of first order.
- To use this course as a base for higher studies and for accomplishing the projects at higher semesters.

UNIT 1 FOURIER SERIES AND APPLICATIONS IN AUTOMOBILE ENGINEERING **10 Hrs.**

Periodic functions, odd and even functions, Euler's formulae for Fourier series in an interval of length 2 pi, change of interval, Dirichlet's conditions, half range Sine and Cosine series, complex Fourier series, Parseval's identity and its applications in Mechanical Oscillations, Applications of Fourier Series in Periodic variation of gas pressure in a 4-stroke internal combustion engine Or the study of Crank rotation in respect of Fourier Series.

UNIT 3 NUMERICAL SOLUTION OF SYSTEM OF LINEAR EQUATIONS & NON-LINEAR EQUATIONS **10 Hrs.**

Solution of transcendental and non-linear equations by Bisection, Regula-Falsi, Newton-Raphson and Secant method. Concept of Ill conditioned system. Solution of a system of linear simultaneous equations by LU Decomposition, Cholesky Decomposition, Jacobi and Gauss Seidel methods

UNIT 3 PARTIAL DIFFERENTIAL EQUATIONS OF FIRST ORDER **10 Hrs.**

Formation of Partial Differential Equations (PDEs), Solutions of PDEs of first order, Cauchy problem for first order PDEs, Lagrange's method, Charpit and Jacobi methods for solving first order nonlinear PDEs.

UNIT 4 PARTIAL DIFFERENTIAL EQUATIONS OF SECOND ORDER **10 Hrs.**

Classification of second order PDEs, method of separation of variables, Fourier series solutions of one-dimensional wave equation, one dimensional heat equation, steady state solution of two-dimensional heat equation, applications of PDEs to string and rod problems pertaining to Mechanical Systems

40 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Identify the role of periodic functions in real world problems.

CO2 – Understand the various techniques to analyze the behavior of different Mechanical periodic systems such as 4 – stroke engines.

CO3 – Solve the differential equations which are not solvable by analytical methods known so far and thus develop a skill to look for alternatives.

CO4 – Discuss the role of partial derivatives in engineering problems where multiple factors affect the system.

CO5 – Evaluate physical problems involving partial derivatives.

CO6 – Develop the ability to model the physical systems in terms of the methods learnt in this course and then solve accordingly.

TEXT / REFERENCE BOOKS

1. E. Kreyszig, Advanced Engineering Mathematics, 10th ed., John Wiley & Sons, 2016.
2. B.S. Grewal, Higher Engineering Mathematics, 44th ed., Khanna Publishers, 2017.
3. R.K. Jain & S.R.K. Iyengar, Advanced Engineering Mathematics, 3rd ed., Narosa Publishing House, 2002.
4. Tai-Ran Hsu, Applied Engineering Analysis, 1st ed., John Wiley & Sons, 2018.
5. K. S. Rao, Introduction to Partial Differential Equations, 3rd ed., PHI Learning Pvt Ltd, New Delhi, 2011.
6. T. Amaranth, An Elementary Course in Partial Differential Equations, 2nd ed., Narosa Publishing House, New Delhi, 2003.