20MA205T					Mathematics – III: Petroleum Engineering					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs. / Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	0	4	25	50	25	--	--	100

COURSE OBJECTIVES

- To understand the concept of partial differential equations and their solution.
- To conceptualize the heat, wave, and Laplace equations and their solution.
- Expansion of periodic functions/waveforms in terms of sine and cosine functions.
- To acquaint the concept of Fourier transform and their applications in physics
- To become familiar about applications of Fourier series to PDEs.

UNIT 1 FOURIER SERIES AND FOURIER TRANSFROM ALONG WITH ITS APPLICATIONS 11 Hrs.

Periodic function, definition and its properties, definition of a Fourier series of function, need of Fourier series, Dirichlet's condition, Finding the coefficients, Fourier series of even and odd function, Extending the scope of Fourier series, Fourier series of arbitrary interval, convergence of Fourier series, Harmonic analysis, applications of Fourier series.
Introduction, definition, existence, Fourier transform of simple functions, properties of Fourier transform, Fourier Sine and Cosine transforms, Fourier transform in science and engineering, Solving differential equations through Fourier transforms.

UNIT 2 PARTIAL DIFFERENTIAL EQUATION 09 Hrs.

Partial Differential Equations: Formation PDEs, Solution of Partial Differential equations f(x,y,z,p,q) = 0, Nonlinear PDEs first order, Some standard forms of nonlinear PDE, Linear PDEs with constant coefficients, Equations reducible to Homogeneous linear form, Classification of second order linear PDEs.

UNIT 3 APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 10 Hrs.

Importance of second order partial differential equations and their classification, method of variable separable, physical significance of elliptic, parabolic and hyperbolic equations, One and two dimension heat, Laplace and wave equations in Cartesian and polar coordinates and their solution by variable separable, Laplace and Fourier transform

UNIT 4 GEOSTATISTICS AND ITS APPLICATIONS 10 Hrs.

Introduction to Geostatics, Probability Theory review, Spatial Analysis, Variogram Modelling, Estimation (Global and Local). Cross validation, Estimators (Simple kriging, Indicator kirging, Block kriging); Geostatistical simulation (Cholesky decomposition, conditional simulation, sequential gaussian simulation- SGS)

40 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1 – Apply the appropriate analytical methods to handle engineering problems whose governing equations are differential equation.
CO2 – Analyze the analytical solution in terms of physics.
CO3 – Analyze mathematical model of real-world problems with mastery of the core concepts.
CO4 – Evaluate the solution of partial differential equations.
CO5 – Evaluate linear second order PDEs using separation of variables and Fourier series for boundary value problems.
CO6 – Formulate physical problems in terms of partial differential equations.

TEXT/REFERENCE BOOKS

1. R. K. Jain & S. R. K. Iyengar, Higher Engineering Mathematics, 3rded., Narosa, 2007.
2. E. Kreyszig, Advanced Engineering Mathematics, 8thed., John Wiley, 1999.
3. M. D. Raisinghania, Ordinary and Partial Differential Equations, 8th ed., S. Chand Publication, 2010.
4. L. Debnath and D. Bhatta, Integral transform and their applications, 3rd ed., Chapman and Hall/CRC, 2014
5. M. R. Spiegel, Fourier Analysis with applications to boundary value problems, Schaum's Outlines, McGraw-Hill education.
6. Paras Ram, Engineering Mathematics through Applications, 2nd ed., CBS Publishers, 2011.