I Year-II Semester		L	T	P	C
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MATHEMATICS-III (R19BS1203)

Prerequisite Course: Basic knowledge of Matrix operations

Course Description and Objectives:

To familiarize the techniques in partial differential equations for handling various real world applications.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes.

CO	Course Outcomes	POs
1	Interpret the physical meaning of different operators such as gradient, curl and divergence, estimate the work done against a field, circulation and flux using vector calculus	4
2	Apply the Laplace transform for solving differential equations	5
3	Find or compute the Fourier series of periodic signals	5
4	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms	4
5	Identify solution methods for partial differential equations that model physical processes	4

Syllabus:

UNIT I:

Vector calculus:

Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential.
Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

UNIT II:

Laplace Transforms:

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (with out proof).
Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT III:

Fourier series and Fourier Transforms:

Fourier series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series. Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – inverse transforms – Finite Fourier transforms.

UNIT IV:

PDE of first order:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT V:

Second order PDE and Applications:

Second order PDE: Solutions of linear partial differential equations with constant coefficients – RHS term of the type e^{ax+by} , cos (ax +by) ,sin(ax + by) ,$x^m y^n$

Applications of PDE: Method of separation of Variables – Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

TEXT BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. Dean. G. Duffy Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
3. Peter O’ Neil, Advanced Engineering Mathematics, Cengage.
4. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.