

# **CURRICULUM TRANSACTIONAL STRATEGY**

## **MMT-C 403: Partial Differential Equation**

### **Syllabus**

**Prerequisites:** Origin and types of PDE.

### **COURSE OBJECTIVES**

1. To give the basic concepts of PDE and its geometric interpretation.
2. To develop the understanding of solving PDE.
3. To understand the linear PDE and its solution using Lagrange's Method.
4. To understand Charpit's method and solution of PDE using this method.
5. To learn Cauchy's characteristics method.
6. To develop those parts of the theory that are prominent like Cauchy's characteristics method, D'Alembert's solution, Canonical form, Method of spherical means, Hadamard's method, inhomogeneous wave equation, mean value property, Green's function and Laplace operator.
7. To introduce the idea of Fourier transform and its applications.
8. To understand Inversion formula and Plancherel theorem..
9. To understand Dirichlet's principle for Laplace equation.

### **COURSE OUTLINE**

#### **UNIT I**

- The basic idea of PDE.
- The geometrical representation of PDE.
- Solution of PDE using some standard methods.
- Cauchy's characteristics method.

#### **UNIT II**

- Classification of PDE.
- Canonical form.
- Method of separation of variables.
- Solution of wave equation, Laplace equation and Heat equation.

### UNIT III

- D'Alemberts of solution of wave equation.
- Poissons method of spherical means.
- Hadmards method of descent.
- Method of spherical means, in-homogenous wave equation.
- Maximum/Minimum principle.
- Greens function and Laplace operator.

### Unit-IV

- Fourier transform, definition and eexamples.
- Riemann Lebesgue lemma.
- Fourier inversion formula.
- Gaussian function and its fourier transform.
- Plancherrel theorem.
- Dirichlets principle

k

### Classroom Transaction

Unit	Topic	Activity	No. of Tutorials	No. of lectures
I	Origin, derivation and types of PDE.	Assignment & Presentation	-	02
	Linear PDE and its solution by Langrages method.	Assignment & Presentation	01	03
	Non linear PDE and its solution by Charpits method.	Assignment and Presentation	01	03
	Some standard types of PDE and Cauchy's characteristics method.	Assignment and Presentation	01	04

	Total		03	12
--	-------	--	----	----

Unit	Topic	Activity	Tutorials	Lectures
II	Classification of higher order PDE.	-	-	02
	Reducing PDE to canonical form.	Assignment & Presentation	01	02
	Method of separating the variables.	Assignment & Presentation	01	02
	Wave equation, Laplace equation and Heat equation.	Assignment	02	06
	Total		04	12

Unit	Topic	Activity	Tutorials	Lectures
III	D'Alemberts method	-	-	01
	Poissons method, method of Spherical means and method of Descent.	Assignment & Presentation	02	05
	Maximum/ Minimum principle.	Assignment & Presentation	01	01
	Mean value property and Greens function.	-	01	03
	Laplace operator	-	01	01

	Total		05	11
--	-------	--	----	----

Unit	Topic	Activity	Tutorials	Lectures
IV	Fourier transform definition and examples.	-	-	01
	Gaussian function and its Fourier transform.	Assignment & Presentation	01	02
	Riemann Lebesgue lemma.	Assignment	-	01
	Fourier inversion formula.	Assignment & presentation.	01	02
	Plancherrel theorem.	Assignment & presentation	-	01
	Dirichlets principle.	Assignment	01	02
	Cauchy's Kawalaskey theorem	Assignment	01	03
	Total		04	12

### TEXT BOOKS:

1. Partial Differential Equation: Fritz John, Springer.
2. Partial Differential Equation: Ian Sneddon, McGraw Hill.
3. Partial Differential Equation: L C Evam, GTM AMS.
4. Partial Differential Equation: Amarnath.