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**INSTRUCTION DIVISION**

**SECOND SEMESTER 2018-2019**

# Course Handout Part II

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

## Course No. : MATH F343

## Course Title : Partial Differential Equations

## Instructor-in-Charge : **Sumit Kumar Vishwakarma**

*Instructor* : Anil Nemili

**Scope and Objective of the Course:**

Enables one to understand the nature of partial differential equations, find solutions to these equations along with some applications in the field of Science and Engineering.

**Textbooks:**

1. Tyn Myint-U and Lokenath Debnath, Linear Partial Differential Equations for Scientists and Engineers, Birkhauser, 4th Edition.

**Reference books**

1. Ian N. Sneddon, Elements of Partial Differential Equations, International Series in Pure and Applied Mathematics.
2. T. Amarnath, An Elementary Course in Partial Differential Equations, Narosa Publishing House, 2nd Edition.
3. K. Sankara Rao, Introduction to Partial Differential Equations, PHI Learning Private Limited, 3rd Edition.

**Course Plan:**

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| --- | --- | --- | --- |
| **Lecture No.** | **Learning objectives** | **Topics to be covered** | **Chapter in the Text Book** |
| 1-3 | Motivation for studying partial differential equations | Introduction of Partial differential equations | 1.1-1.6 |
| 4-6 | Introduction and overview of first order partial differential equations | Introduction, First order linear equations | 2.1-2.4 |
| 7-12 | Geometrical interpretation of first order PDEs, Canonical form of first order linear equations, To Find solutions of first order PDEs | Methods of Characteristics, Canonical Form, Method of Separation of variables, Charpit's Method, Jacobi Method | 2.5-2.7,  R1-2.10-2.14 |
| 13 | Introduction of second order partial differential equations | Second order equations in two variables | 4.1 |
| 14-16 | To convert the second order differential equations into the standard form  Characterization of 2nd order PDE's and its solutions | Canonical Form | 4.2 |
| 17-18 | To convert the second order differential equations into the standard form | Equations with constant Coefficients | 4.3, R1-3.4 |
| 19 | Difference between general solution of ODEs and PDEs | General solution | 4.4 |
| 20-25 | Solution of Homogeneous and inhomogeneous wave equations, D'Almbert Principle, Duhamel Principle, Spherical and cylindrical wave equations | Wave equation | 5.1-5.2,  5.3-5.6,  5.10-5.11 |
| 26-29 | To obtain the maximum and the minimum of solutions of PDEs | Maximum-minimum principles | 9.1-9.9 |
| 30-32 | Solution of Laplace equations in different domains with homogeneous boundary condition | Laplace Equation | 10.1-10.4 |
| 33-35 | Analysis and behavior of solutions of heat and wave equations in two and three dimensions | Heat and Wave Equations | 10.5-10.9 |
| 36-37 | Solution of PDEs in terms of Green's functions | Green's Functions | 11.1-11.5 |
| 38-40 | Use of Fourier techniques in finding the solutions of PDEs | Fourier Transform | 12.2-12.6 |
| 41-42 | Use of Laplace techniques in finding the solutions of PDEs | Laplace Transform | 12.8-12.10 |

**Evaluation Scheme:**

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| --- | --- | --- | --- | --- |
| **Component** | **Duration** | **Weightage (%)** | **Date & Time** | **Nature of Component** |
| Quizzes  (2 quizzes each of 5%) |  | 10 | To announced in the class | Closed book |
| Assignments  (4 assignment each of 5%) |  | 20 | To be announced in the class | Open Book |
| Mid-semester | 90 mins | 30 |  | Closed Book |
| Comprehensive Exam | 3 hr | 40 |  | Closed Book |

**Chamber Consultation Hour:** To be announced in the class.

**Notices:** All notices about the course will be put only on CMS/Mathematics Notice Board.

**Make-up Policy:**  Make up of evaluation components will be granted only in genuine cases. Permission must be taken in advance except in extreme cases.

**INSTRUCTOR-IN-CHARGE**