Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2023-2024

Course Handout Part II

09-01-2024

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 : *Dr. G. Murali Mohan Reddy*
Instructors : *Amit Kumar Pal, Shivangi Joshi*

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:

T1. Tyn Myint-U and Lokenath Debnath, Linear Partial Differential Equations for Scientists and Engineers, Birkhauser, 4th Edition.

Reference books

R1. Ian N. Sneddon, Elements of Partial Differential Equations, International Series in Pure and Applied Mathematics.
R2. T. Amarnath, An Elementary Course in Partial Differential Equations, Narosa Publishing House, 2nd Edition.
R3. K. Sankara Rao, Introduction to Partial Differential Equations, PHI Learning Private Limited, 3rd Edition.

Course Plan:

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
20-24	Solution of Homogeneous and inhomogeneous wave equations, D'Almbert Principle, Duhamel Principle, Spherical and cylindrical wave equations (self study)	Wave equation	5.1-5.2, 5.3-5.6, 5.10-5.11
25-28	To obtain the maximum and the minimum of solutions of PDEs	Maximum-minimum principles	9.1-9.9
29-31	Solution of Laplace equations in different domains with homogeneous boundary condition	Laplace Equation	10.1-10.4
32-34	Analysis and behavior of solutions of heat and wave equations in two dimensions and three dimensions	Heat and Wave Equations	10.5-10.9
35-37	Use of Fourier techniques in finding the solutions of PDEs	Fourier Transform	12.2-12.6
38-39	Use of Laplace techniques in finding the solutions of PDEs	Laplace Transform	12.8-12.10
40	Solution of PDEs in terms of Green's functions	Green's Functions	11.1-11.5

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Quiz 1	To be announced in the class	10	To announced in the class	Closed book
Project	To be announced in the class	10	To announced in the class	Open book
Mid-semester	90 mins	30	14/03 - 9.30 - 11.00AM	Closed book
Quiz 2	To be announced in the class	10	To be announced in the class	Open Book
Comprehensive Exam	180 mins	40	13/05 FN	Closed book

Chamber Consultation Hour: To be announced in the class.
Notices: All notices about the course will be put only on CMS.
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.
Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

INSTRUCTOR-IN-CHARGE

MATH F343