BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE PILANI
K K BIRLA GOA CAMPUS

INSTRUCTION DIVISION
FIRST SEMESTER 2024-2025
Course Handout (Part II)

Date: 31/07/2024

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 F211
Course Title	MATHEMATICS III
Instructor In-charge:	MINHAJUL
Instructors:	Danumjaya Palla, Anil Kumar, Jajati Keshari Sahoo, Mayank Goel, Pradeep Boggarapu, Anupama Sharma, Yasmeen Akhtar, Minhajul.
Teaching Assistants:	Debendra Prasad Panda, Yogesh Trivedi, Binay Sahu, Vighnesh Vinod Alavani, Raina Mary Thomas**,** Ranjit Kumar Sharma.

1. Objective of the Course

The Course offers a comprehensive and advanced exploration of differential equations, primarily emphasizing classical techniques for solving ordinary and partial differential equations. Its primary goal is to equip students with fundamental skills to apply differential equations, Fourier series, and Laplace transforms in a wide range of engineering and scientific disciplines. An integral aspect of the Course involves an in-depth examination of the significance of orthogonal polynomials. This in-depth study gives students valuable insights into effectively tackling complex differential equations in diverse real-world situations.

2. Learning Outcomes

Upon completing this course, students will have achieved the following learning outcomes:

- Proficiently solve first-order separable and linear differential equations and adeptly apply these methods to solve real-world problems in various contexts.
- Skillfully solve higher-order constant-coefficient linear differential equations and systems of differential equations, utilizing these techniques to address practical problems encountered in engineering and sciences.
- Attain the ability to derive power series solutions for specific linear ordinary differential equations classes.
- Develop a strong understanding of obtaining Laplace and inverse Laplace transforms and effectively apply these techniques to solve linear differential equations.

3. Text-Book:

G. F. Simmons, *Differential Equations with Applications and Historical Notes,* TMH, 2nd Ed., 1991.

Reference Books:

i). Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons, 8th Ed., 2005.

ii). W. E. Boyce and R. C. Diprima, *Elementary Differential Equations and Boundary Value Problems*, John Wiley & Sons, 9th edition, 2013.

iii). Earl A. Coddington, *An Introduction to Ordinary Differential Equations*, Prentice Hall, 2013.

iv). C. H. Edwards and David E. Penney, *Elementary Differential Equations*, Pearson, 6th Ed. 2008.

4. Course Plan: (Sections/Articles refer to **Text-Book**)

Lecture No.	Learning Objectives	Topic	Sections	Assignments (Page No-Problems)
1	To introduce classical methods for solving first-order differential equations (DEs).	First order equations	1-6	**Self-Study**
2		First order equations	7-10	**49-** 1, 3-5**, 53**-All, **59**-All 61- 1 to 4
3-4	To introduce the classical methods to solve second-order DEs	Second order equations	14, 15	**86**-4 to 10, 91-1 to 9
5		Use of a known solution	16	**94**-All
6-10		Various methods to solve differential equations	17, 18, 19	**97**-All, **103**-All, **106-** All
11-12		Higher-order equations and operator methods	22, 23	**127**-1 to 8, **135**-All
13-15	To introduce systems of equations	Systems of equations	54, 55, 56	**420**-1, 2; 426-5 to 9 **433**-1 to 5
16-20	To introduce power series solutions to second-order DEs with variable coefficients	Series solutions	26 to 30	**175**-1, 2, **182**-1 to 7. **191**-1 to 5, **198**-1 to 5
21-22		Hypergeometric equation	31	**203**-All
23-26	Special Functions in Mathematical Physics and Their Applications	Legendre polynomials	44, 45	**340**-1, 2, 4 **347**-1 to 5
27-30		Bessel functions	46, 47	**356**-1 to 6, **363**-1 to 5
31-34	Use the Laplace transform to solve differential equations.	Laplace transforms	48, 49, 50, 51, 52	**384**-All, **388**-All, **394**-1 to 5, **397**-1 to 8, **410**-2, 3, 4
35-38	To introduce the Fourier series	Fourier series	33, 34, 35, 36	**256**-1 to 6, 263-1 to 5 **269**-All, **274**-1 to 7

39	BVPs and Partial Differential Equations (PDEs)	Eigenvalues and Eigen functions, and PDEs	40	**308**-1
40	To introduce classical methods to solve PDEs	One dim. Wave eqn.	40	
41		One dim. Heat eqn.	41	
42		Laplace Equation and Sturm Liouville Problems	42-43	

5. Evaluation Scheme:

S. No.	Evaluation Component	Weightage (300 marks)	Date and time
1	Mid-Semester Exam (Closed Book)	105 marks	05/10/2024 04:00 PM – 05:30 PM
2	Quizzes (Open Book)	Quiz-1 (75 marks)	22/09/24 (Sunday) 11:00 AM – 12:00 PM
		Quiz-2 (75 marks)	17/11/24 (Sunday) 11:00 AM – 12:00 PM
3	Comprehensive Exam (Closed Book)	120 marks	07/12/2024 (FN)

6. **Make-up: There will be no make-up for the Quizzes** as the best one will be chosen out of two Quizzes**.** Make-up for other evaluation component will be given only in genuine cases of absence.

7. **Consultation hour:** To be announced in the class.

8. **Notices:** All notices regarding the MATH F211 course will be posted on the Quanta course page.

Instructor In-charge
MATH F211