

**BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE PILANI**  
**K K BIRLA GOA CAMPUS**  
**INSTRUCTION DIVISION**  
**FIRST SEMESTER 2018-2019**  
**Course Handout (Part-II)**

Date: 01/08/2018

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

<b>Course No.</b>	<b>: MATH F211</b>
<b>Course Title</b>	<b>: MATHEMATICS III</b>
<b>Instructor In-charge</b>	<b>: Dr. JAJATI KESHARI SAHOO</b>
<b>Instructors</b>	: Dr. Anil Kumar, Prof. Danumjaya Palla, Dr. Manoj Kumar Pandey Dr. Mayank Goel, Dr. Jajati Keshari Sahoo, Dr. Amit Setia
<b>Tutors</b>	: Mr. Santosh Kumar Bhal, Mr. Ashish Kumar Nandi Mr. Pabitra Kumar Pradhan, Mr. Bijaya Kumar Sahu

### **1. Objective of the Course:**

The Course reviews and continues the study of differential equations with the objective of introducing classical methods for solving ordinary differential equations as well as partial differential equations. This course serves as a basis for the applications of differential equations, Fourier series and Laplace transform in various branches of engineering and sciences. The course emphasizes the role of orthogonal polynomials in dealing with Sturm-Liouville problems.

### **2. Learning Outcomes**

Upon completing this course students should be able to:

- (i) Solve first-order separable and linear differential equations, and use these methods to solve applied problems.
- (ii) Solve higher-order constant-coefficient linear differential equations and systems of differential equations, and use these methods to solve applied problems.
- (iii) Obtain power series solutions for certain classes of linear ordinary differential equations.
- (iv) Find Laplace transforms and inverse Laplace transforms, and apply these 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, 8<sup>th</sup> Ed., 2005.
- II. W. E. Boyce and R. C. DiPrima, *Elementary Differential Equations and Boundary Value Problems*, John Wiley & sons, 9<sup>th</sup> edition, 2013.
- III. Earl A. Coddington, *An Introduction to Ordinary Differential Equations*, Prentice Hall, 2013.

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

Lect. No.	Learning Objectives	Topic	Sections	Assignments (Page No-Problems)
1	To introduce the classical methods to solve 1 <sup>st</sup> order differential equations (DEs)	First order equations	1-6	<b>Self Study</b>
2-4		First order equations	7-10	<b>49-</b> 1, 3-5, <b>53-</b> All, <b>59-</b> All <b>61-</b> 1 to 4
5		Reduction of order	11	<b>65-</b> 1 to 3
6	To introduce the classical methods to solve 2 <sup>nd</sup> order DEs	Second order equations	14, 15	<b>86-</b> 4 to 10, <b>91-</b> 1 to 9
7		Use of a known solution	16	<b>94-</b> All
8-12		Various methods to solve differential equations	17, 18, 19	<b>97-</b> All, <b>103-</b> All, <b>106-</b> All
13-14		Higher order equations and operator methods	22, 23	<b>127-</b> 1 to 8, <b>135-</b> All
15-16	To introduce systems of equations	Systems of equations	54, 55, 56	<b>420-</b> 1, 2; <b>426-</b> 5 to 9 <b>433-</b> 1 to 5
17-20	To introduce power series solutions to 2 <sup>nd</sup> order DEs with variable coefficients	Series solutions	26, 27, 28, 29, 30	<b>175-</b> 1, 2, <b>182-</b> 1 to 7. <b>191-</b> 1 to 5, <b>198-</b> 1 to 5
21-22		Hypergeometric equation	31	<b>203-</b> All
23-24		Legendre polynomials	44, 45	<b>340-</b> 1, 2, 4 <b>347-</b> 1 to 5
25-27		Bessel functions	46, 47	<b>356-</b> 1 to 6, <b>363-</b> 1 to 5
28-32	Use Laplace transform to solve differential equations	Laplace transforms	48, 49, 50, 51, 52	<b>384-</b> All, <b>388-</b> All, <b>394-</b> 1 to 5, <b>397-</b> 1 to 8, <b>410-</b> 2, 3, 4
33-37	To introduce Fourier series	Fourier series	33, 34, 35, 36	<b>256-</b> 1 to 6, <b>263-</b> 1 to 5 <b>269-</b> All, <b>274-</b> 1 to 7
38	To introduce partial differential equations (PDEs)	Eigenvalues and Eigen functions, Sturm Liouville Problems	40, 43	<b>308-</b> 1
39	To introduce classical methods to solve PDEs	One dim. Wave eqn.	40	<b>309-</b> 5 to 7
40		One dim. Heat eqn.	41	
41		Laplace eqn.	42	

## 5. Evaluation Scheme:

S. No.	Evaluation Component	Duration	Marks (Out of 300)	Date and time	Remarks
1	Mid-Semester Exam	1 hour 30 minutes	90	08/10/2018, 9:00AM – 10:30 AM	Closed Book
2	Assignment/Group Quiz		10		To be announced
3	Quiz-I	40 minutes	40	09/09/2018 11.00AM – 11.40AM	Open Book
4	Quiz-II	40 minutes	40	11/11/2018 11.00AM – 11.40AM	Open Book
5	Comprehensive Exam	3 hours	120	06/12/2018 (AN)	Closed Book

6. **Make-up:** Make-up will be given only in genuine cases of absence.

7. **Chamber consultation hour:** To be announced in the class.

8. **Notices:** All notices regarding MATH F211 will be displayed on LMS.

**Instructor In-charge  
MATH F211**