

**FIRST SEMESTER 2023 - 2024**

# Course Handout Part II

**Date: 11.08.2023**

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

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| ***Course No.*** | : MATH F211 |
| ***Course Title*** | : MATHEMATICS - III |
| ***Instructor‑in‑charge*** | : Dr. K. Bhargav Kumar |
| ***Instructors*** | : TSL Radhika, Jagan Mohan J, Santanu Koley, PK Sahoo, GMM Reddy,  K. Bhargav Kumar, Jhuma Sen Gupta, Komal Kumar, Lakhan Valmik Jaybhaye, Zinnat Hassan, Sai Swagat Mishra, Nitin Kumar Sharma, Amit Kumar Pal, Sangeeta Dhawa, Sushil Pathak, Dheeraj Singh Rana, Gaurav Narayanrao Gadbail, Lohakare Santosh Vijay, Lokesh Kumar Duchaniya, Kadam Siddheshwar Atmaram, Tapaswini Patro, Shubham Atmaram Narawade, Rahul Vijay Bhagat, Debasmita Mohanty, Suman Prabha Yadav, Debismita Nayak, Aaqid Mohi Ud Din Bhat. |

1. **Scopes and Objective of the Course:**

This course reviews and continues with differential equations to introduce classical methods for solving higher order ordinary differential equations, partial differential equations, and boundary value problems. It also introduces an elegant way to solve some differential equations occurring in mathematical physics. Further, this course presents the Fourier series and Laplace transform technique that finds applications in various branches of engineering and sciences. It also emphasizes the role of orthogonal polynomials in dealing with Sturm - Liouville problems.

1. **Text Books:**

**1.** Simmons, G. F., Differential Equations with Applications and Historical Notes, TMH Edition 2003, 12th Reprint 2008.

**Reference Books**:

**1**. Shepley L. Ross: Differential Equations, John Wiley & Sons Inc., 2018.

**2**. Braun, M.: Differential Equations and Their Applications, Springer – Verlag, 1982.

**3**. Kreider, D. L. & Others: An Introduction to Linear Analysis, Addison – Wesley Limited, 1966.

1. **Course Plan:**

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| --- | --- | --- | --- |
| **Lecture No.** | **Learning Objectives** | **Topics to be covered** | **Chapter in the Text Book** |
| 1 | To study methods for solving first-order differential equations | Introduction to first-order equations | 1-7 |
| 2-4 | First-order equations | 8-10 |
| 5 | Reduction of order | 11 |
| 6-7 | To learn about second and higher-order differential equations and various methods for solving them | Second order equations | 14,15 |
| 8 | Use of a known solution | 16 |
| 9-12 | Various methods to solve differential equations | 17-19,22,23 |
| 13-14 | To understand the method of solving system of differential equations | Systems of equations | 54-56 |
|  | To study qualitative properties of solutions of differential equations | Sturm separation theorem and Sturm comparison theorem  (Self - Study) | 24, 25 |
| 15-17 | To study an elegant method to solve higher order differential equations | Series solutions | 26-30 |
| 18-19 | Hypergeometric equation | 31 |
| 20-22 | To learn about some special functions of mathematical physics | Legendre polynomials | 44,45 |
|  |  |  |
| 23 | Chebyshev polynomials | Appendix D |
|  | Hermite polynomials (Self - Study) | Appendix B |
| 24-27 | Bessel functions | 46,47 |
| 28-31 | To study Laplace transform technique for solving differential and integral equations | Laplace transforms | 48-53 |
| 32-33 | To learn trigonometric series expansion of discontinuous functions | Fourier series | 33-36 |
| 34-37 | To learn methods to solve boundary value problems | Eigenvalues and eigenfunctions, Sturm - Liouville problems | 40, 43 |
| 38-40 | To learn methods to solve linear partial differential equations | One-dimensional wave equation,  One-dimensional heat equation,  Laplace’s equation | 40, 41, 42 |

1. **Evaluation Scheme :**

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| --- | --- | --- | --- | --- |
| **Evaluation Component** | **Duration** | **Weightage** | **Date & Time** | **Nature of Component** |
| Assignment 1 | - | 10% | To be announced | Open book |
| Mid Semester | 90 Minutes | 35% | 10/10 - 9.30 - 11.00AM | Closed book |
| Assignment 2 | - | 10% | To be announced | Open book |
| Compre | 180 Minutes | 45% | 08/12 FN | Closed book |

\* The total marks of all the components taken together will be 200.

**5. Chamber Consultation Hour:** To be announced by the individual instructor.

**6. Notices:** All notices regarding this course will be displayed on CMS.

**7. Make-up Policy:** Make-up for any component will be given only for very genuine cases and it also depends upon the feasibility. Prior permission has to be obtained from Instructor-in-charge.

8. **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 F211**