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**FIRST SEMESTER 2020-2021**

# Course Handout Part II

17-08-2020

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

***Course No.* :** MATH F211

***Course Title* :** MATHEMATICS - III

***Instructor‑in‑charge* :** Santanu Koley

***Instructors* :** B Mishra, Anil Nemili, PK Sahoo, Kishore Kumar, TSL Radhika,

Nirman Ganguly, Santanu Koley, PTV Praveen Kumar, Jagan Mohan J,

K Bhargav Kumar, Sabyasachi Dey, A Ramu, K Panduranga,

Kshma Trivedi, N S Gopal, Simran Arora, Sanjay Mandal,

Tusharakanta Pradhan, SSS Anupindi

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

This course reviews and continues with the study of differential equations with an objective to introduce classical methods for solving higher order ordinary differential equations, boundary value problems and partial differential equations. It also introduces an elegant method to solve some differential equations occurring in mathematical physics. Further, this course presents 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 Book:** Simmons G.F., Differential Equations with Applications and Historical Notes, TMH Edition

2003, 12th reprint 2008.

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

1. Kreider D.L. and Others: An Introduction to Linear Analysis, A.W., 1966.
2. **Course Plan:** (Sections- refer to Text Book)

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| --- | --- | --- | --- |
| **Lecture No.** | **Learning Objectives** | **Topics to be covered** | **Sections** |
| 1 | To study methods for solving first order differential equations | Introduction to First order equations. | 1-6 |
| 2-4 | First order equations | 7-10 |
| 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 |
| 15-16 | To study an elegant method to solve higher order differential equations | Series Solutions | 26-30 |
| 17-19 | 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 |
| 32-34 | To learn trigonometric series expansion of discontinuous functions | Fourier Series | 33-36 |
| 35-38 | To learn methods to solve Boundary Value Problems | Eigen values and Eigen functions, Sturm Liouville Problems | 40, 43 |
| 39-42 | To learn methods to solve linear partial differential equations | One dim. Wave equation,  One dim. Heat equation,  Laplace’s equation | 40, 41, 42 |

1. **Evaluation Scheme :**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Evaluation Component** | **Duration** | **Weightage** | **Date & Time** | **Nature of Component** |
| Test-1 | 30 min. | 15% | September 10 –September 20  (During scheduled class hour) | Open book |
| Assignment-1 |  | 10% | To be announced | Open book |
| Test-2 | 30 min. | 15% | October 09 –October 20  (During scheduled class hour) | Open book |
| Assignment-2 |  | 10% | To be announced | Open book |
| Test-3 | 30 min. | 15% | November 10 – November 20  (During scheduled class hour) | Open book |
| Compre. Exam. | 120 min. | 35% | To be announced | Open book |

**5. Make-up:** Make-up for any component will be given only for very genuine cases and it also depend upon feasibility. Prior permission has to be obtained from Instructor In-charge.

**6. Chamber consultation hour:** To be announced by the individual instructors.

**7. Notices:** All notices regarding MATH F211 will be put on CMS.

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**