## NIRMA UNIVERSITY

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| **Institute:** | Institute of International Studies |
| **Name of Programme:** | BS (CSE) |
| **Course Code:** | 2MH201 |
| **Course Title:** | Differential Equations and Laplace Transformation |
| **Course Type:** | Core |
| **Year of introduction:** | 2023-2024 |

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**Course Learning Outcomes (CLOs):**

At the end of the course, the students will be able to –

1. classify the differential equations with respect to their order, degree, linearity and independent variables (BL2)
2. convert the real-world problem into differential equations (BL2)
3. solve differential equations in the field of computer science (BL3)
4. apply Laplace transform to solve initial value problems (BL3)

**Syllabus:** **Total Teaching hours:45**

| Unit | Syllabus | Teaching hours |
|---|---|---|
| **Unit I** | **Ordinary Differential Equations:** Definition, Order and degree of differential equations, Formation of ordinary differential equations, Solution of differential equations, First order differential equations, Higher order linear differential equations with constant coefficients, Complementary function and particular integral of differential equations, Method of variation of parameters, System of linear differential equations, Equations reducible to linear differential equations with constant coefficients, Application of ordinary differential equations in computer science | **20** |
| **Unit II** | **Partial Differential Equations:** Formation of partial differential equations, First order partial differential equations, Solutions of first order linear and non-linear partial differential equations, Method of separation of variable, Application of partial differential equations in computer science | **11** |
| **Unit III** | **Laplace Transformations:** Definition, Linearity property, Laplace transforms of elementary functions, shifting theorem, Inverse Laplace transforms, Laplace of differentiation and integration, Differentiation and integration of Laplace transform, Convolution theorem, Application of Laplace transforms in solving ordinary differential equations, Laplace transforms of periodic function, Unit step and impulse functions | **14** |

**Tutorial Works:**
This shall consist of 15 tutorials based on the syllabus.

**Self-Study**:
Self-study contents will be declared at the commencement of the semester. Around 10 % of the questions will be asked from the self-study contents.

**Suggested Readings/ References:**


1. G F Simmons and S G Krantz, Differential Equations; McGraw Hill
2. W E Boyce and R C DiPrima, Elementary Differential Equations and Boundary Value Problems; Wiley India
3. S L Ross, Differential Equations; Wiley India
4. E Kreyszig, Advanced Engineering Mathematics; John Wiley & Sons
5. B S Grewal, Higher Engineering Mathematics; Khanna Publications
6. B Davies, Integral Transforms and their Applications; Springer