

19HS110 ENGINEERING MATHEMATICS II (D)

DIFFERENTIAL EQUATIONS, LAPLACE TRANSFORMATIONS

Hours Per Week :

| | | | |
|---|---|---|---|
| L | T | P | C |
| 3 | 1 | 2 | 5 |

Total Hours :

| | | | | | | | | |
|----|----|----|-------|---------|----|----|---|----|
| L | T | P | WA/RA | SSH/HSH | CS | SA | S | BS |
| 45 | 15 | 30 | 20 | 45 | | 10 | - | 5 |



Source: www.google.co.in

COURSE DESCRIPTION AND OBJECTIVES:

To provide students with solid foundation in Mathematical fundamentals such as numerical methods, differential equations, Laplace transformations required for Engineering applications.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

| COs | Course Outcomes | POs |
|-----|---|------|
| 1 | Discuss the Laplace transformation of a function and apply to solve differential equations. | 1, 2 |
| 2 | Apply various analytical methods to solve ordinary differential equations. | 1, 2 |
| 3 | Demonstrate the various numerical methods to solve differential equations. | 1, 2 |
| 4 | Identify the appropriate method to solve apartial differential equation. | 1, 2 |
| 5 | Use software tools to obtain and verify the solutions. | 5 |

SKILLS:

- ✓ Find the capacitor voltage for the given circuit.
- ✓ Analyze variety of phenomenon in nature such as sound, heat, electro statistics, fluid flow, elasticity etc. through differential and partial differential equations.

UNIT – I**L-9**

FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS : Basic Definitions, Variables separable, homogeneous differential equations, Linear differential equations, Bernoulli's differential equations, Exact and non-exact differential equations.

UNIT – II**L-9**

HIGHER ORDER ORDINARY DIFFERENTIAL EQUATIONS : Linear differential equations with constant coefficients, Homogeneous differential equations of second and higher order, Methods to find particular integral when RHS is of the form : e^{ax} , $\sin ax$, $\cos ax$ and x^n .

UNIT – III**L-9**

PARTIAL DIFFERENTIAL EQUATIONS : Introduction, Partial differential equations, Order and degree, Formation of partial differential equations; Lagrange's linear equations, Method of multipliers, Classification of Second order PDE, Method of Separation of variables, Examples: One dimensional wave equation, Heat equation and Laplace's equation.

UNIT – IV**L-9**

NUMERICAL METHODS – III : Taylor series method, Picard's method, Euler's and modified Euler's method, Runge-Kutta method.

UNIT – V**L-9**

LAPLACE TRANSFORMATIONS : Introduction, Laplace transformation, Properties, Change of scale property, Shifting theorems, Laplace transformation of derivative, Laplace transformation of integral, Multiplication by t , Initial and final value theorems, Convolution theorem.

Inverse Laplace transformation, Multiplication by s , Division by s , Shifting properties, Inverse Laplace transformation of derivatives; Applications : Solutions of ordinary differential equations.

ACTIVITIES:

- o *Compute the numerical solutions to the partial differential equations.*
- o *Solve the given differential equation using suitable method.*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS

TOTAL HOURS:30

1. Differentiation of functions of one or two variables.
2. Integration of functions of one or two variables.
3. Definite Integration functions of one variable.
4. Trapezoidal rule for numerical integrations.
5. Simpson's rules for numerical integrations.
6. Boole's rule, Weddle's rules for numerical integrations.
7. Lagrange Interpolation for given data.
8. Solving ordinary Differential Equations.
9. Euler's method for first order differential equation.
10. Runge-Kutta method for first order differential equation.
11. Plotting of graphs for functions one variable.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", S. Chand & Co., 3rd edition, 2015
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2018.

REFERENCE BOOKS:

1. John Bird, "Higher Engineering Mathematics", Routledge (Taylor & Francis Group), 2018.
2. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
3. B. V. Ramana, "Advanced Engineering Mathematics", TMH Publishers, 2008.
4. N. P. Bali and K. L. Sai Prasad, "A Textbook of Engineering Mathematics I, II, III", Universal Science Press, 2018.
5. T. K.V. Iyengar et al., "Engineering Mathematics, I, II, III", S. Chand & Co., 2018.