21HS106 ENGINEERING MATHEMATICS I (F)
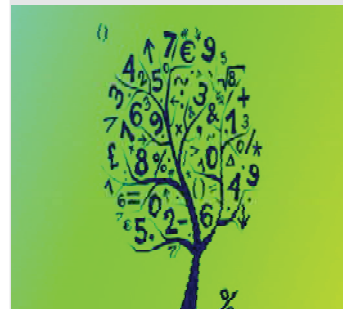### CALCULUS & NUMERICAL METHODS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

COURSE DESCRIPTION AND OBJECTIVES:

To acquaint students with principles of mathematics through numerical methods, partial differentiation, vector calculus, Fourier series that serves as an essential tool in several Engineering applications.

COURSE OUTCOMES:

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

COs	Course Outcomes
1	Illustrate the concept of Fourier series.
2	Apply various numerical methods for integration and interpolation.
3	Understand the notions of partial differentiation and instances of its applications.
4	Summarize the vector differentiation.
5	Use software tools to obtain and verify the solutions.

SKILLS:

✓ *Interpret interpolation techniques to estimate the functional values.*

✓ *Develop the skills to interpolate the functional values.*

✓ *Solve the partial differential equation by appropriate method.*

✓ *Evaluate surface and volume integrals through vector integral theorems.*

✓ *Evaluate the Fourier series of a given equation.*

UNIT- I   **L-9**

NUMERICAL METHODS-I :

NUMERICAL INTEGRATION: Trapezoidal rule, Simpson's 1/3 rule, Simpsons 3/8 rule.

SOLUTIONS OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS: Introduction, Bisection method, Iteration method, Newton-Raphson method.

UNIT- II   **L-9**

INTERPOLATION: Introduction, Finite differences, Forward differences, Backward differences, Newton's formulae for interpolation, Gauss forward and backward interpolation formulae, Interpolation with unevenly spaced points, Lagrange's interpolation formula.

UNIT- III   **L-9**

PARTIAL DIFFERENTIATION AND APPLICATIONS: Partial derivatives, Partial derivatives of higher order, Homogeneous function, Euler's theorem, Total differential coefficient.

Maxima and Minima of a function of two variables, Conditions for extreme values, Lagrange method of undetermined multipliers.

JACOBIANS: Definition, Properties, Jacobian of implicit functions.

UNIT- IV   **L-9**

VECTOR DIFFERENTIATION: Review of vector algebra (Not for testing) vector function, Differentiation, Scalar and vector point functions, Gradient, Normal, Directional derivate, Divergence, Curl, Vector identities.

UNIT- V   **L-9**

FOURIER SERIES: Periodic functions, Fourier series, Dirichlet's conditions, Fourier series for discontinuous functions, Fourier series for function defined in two or more sub-ranges, Fourier series for even and odd functions, Half-range series, Change of interval and functions having arbitrary period.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co., 2015.

2. B. S. Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, 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.