

SDM COLLEGE OF ENGINEERING & TECHNOLOGY, DHARWAD

ENGINEERING MATHEMATICS-II

(Common to all branches)

(Effective from the academic year 2019-20)

Course Code: 18UMAC200

Contact Hours/Week: 04(3L+1T)

Total Hours: 50 (8L+2T per Unit)

Semester: II

CIE Marks: 50

SEE Marks: 50

Exam Hours: 03

Credits: 04

Course Learning Objectives: The purpose of the course is to facilitate the students with concrete foundation of vector calculus, ordinary and partial differential equations, infinite series and numerical methods enabling them to acquire the knowledge of these mathematical tools.

Description of the course outcomes : On completion of this course, students are able to:

CO.1	Explain various physical models through higher order differential equations and solve such linear ordinary differential equations.
CO.2	Solve problems on partial differential equations by method of separation of variables.
CO.3	Describe the applications of infinite series and obtain series solution of Bessel's differential equations.
CO.4	Apply the knowledge of numerical methods to fit an interpolating curve to the experimental data and obtain solution of transcendental equation and use numerical methods for engineering application.
CO.5	Compute Gradient, Divergence, Curl of vector valued functions and Illustrate the Engineering applications through vector calculus.

CHAPTER-I

Differential Equations of higher order:-

Second order linear ODE's with constant coefficients-Inverse differential operators, Method of Variation of Parameters; Legendre's homogeneous equations. Applications to oscillations of a spring and L-C-R circuits.

Self Study: Cauchy's homogeneous equations.

8L+ 2T

CHAPTER -II

Partial Differential Equations (PDE's):

Formation of PDE's by elimination of arbitrary constants / functions. Solution of PDE by variable separable method. Derivation of one dimensional heat and wave equations and solution of wave equation by the method of separation of variables. Numerical solution of Laplace equation by Five-point formula and Diagonal formula.

Self Study: Solution of heat equation by the method of separation of variables.

8L+ 2T

CHAPTER-III

Infinite Series: Convergence and divergence of infinite series- Comparison test, D'Alembert's ratio test (without proof)- Cauchy's root test (without proof)- and Illustrative examples.

Special functions. Series solution of Bessel's differential equation leading to $J_n(x)$ - Bessel's function of first kind, Recurrence relations, orthogonality of Bessels function

Self Study: Generating function of Bessel's functions.

8L+ 2T

CHAPTER –IV

Elementary Numerical Methods:

Solution of polynomial and transcendental equations – Newton-Raphson's and Regula-Falsi methods (only formulae) - Illustrative examples.

Finite differences. Interpolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae (All formulae without proof).

Numerical integration: Simpson's (1/3)rd rule, Weddle's rule (without proof). Problems.

Self Study: Numerical integration by Simpson's (3/8)th rule. **8L+ 2T**

CHAPTER- V

Vector Calculus:-

Vector Differentiation: Scalar point function and vector point functions. Gradient, Directional Derivative; Curl and Divergence-physical interpretation. Solenoidal and irrotational vectors. Illustrative problems.

Vector Integration: Line integrals, Surface integrals and volume integrals. Green's theorem, Gauss divergence theorem and Stoke's theorem (only statements). Illustrative example.

Self Study: Applications to work done by a force. **8L+ 2T**

Text Books:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2017.
2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint), 2016.

Reference books:

1. C.Ray Wylie, Louis C.Barrett : "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill Book Co., New York, 1995.
2. N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2010.
3. B.V.Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Veerarajan T., "Engineering Mathematics for First year", Tata McGraw-Hill, 2008.
5. Thomas G.B. and Finney R.L."Calculus and Analytical Geometry"9th Edition, Pearson, 2012.

Web links and Video Lectures:

1. <http://nptel.ac.in/courses.php?disciplineID=111>
2. [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
3. <http://academicearth.org/>

Course Outcomes: On completion of this course, students are able to:

COs	Description of the course outcomes	Mastering 3	Moderate 2	Introductory 1
CO.1	Explain various physical models through higher order differential equations and solve such linear ordinary differential equations.		1,2	
CO.2	Solve problems on partial differential equations by method of separation of variables.		1,2	
CO.3	Describe the applications of infinite series and obtain series solution of ordinary differential equations.			1
CO.4	Apply the knowledge of numerical methods to fit an interpolating curve to the experimental data and obtain solution of transcendental equation and use numerical methods for engineering application.		1,2	
CO.5	Compute Gradient , Divergence, Curl of vector valued functions and Illustrate the Engineering applications through vector calculus.			1,2

POs	1	2	3	4	5	6	7	8	9	10	11	12
Mapping Level	1.6	1.4										

1.Introductory (Slight); 2. Reinforce (Moderate); 3.Mastering (Substantial)