PaperCode: BS111	Paper: Engineering Mathematics – I	L	T/P	C
PaperID: 99111		4	-	4

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instruction for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus.This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives:

1:	To understand use series, differential and integral methods to solve formulated engineering problems.
2:	To understand use Ordinary Differential Equations to solve formulated engineering problems.
3:	To understand use linear algebra to solve formulated engineering problems.
4:	To understand use vector calculus to solve formulated engineering problems.

Course Outcomes (CO):

CO1:	Ability to use series, differential and integral methods to solve formulated engineering problems.
CO2:	Ability to use Ordinary Differential Equations to solve formulated engineering problems.
CO3:	Ability to use linear algebra to solve formulated engineering problems.
CO4:	Ability to use vector calculus to solve formulated engineering problems.

Course Outcomes (CO to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	2	3	3	3	1	-	-	-	-	-	1	2
CO2	2	3	3	3	1	-	-	-	-	-	2	2
CO3	2	3	3	3	1	-	-	-	-	-	2	2
CO4	2	3	3	3	1	-	-	-	-	-	2	2

Unit I

Partial derivatives, Chain rule, Differentiation of Implicit functions, Exact differentials.Maxima, Minima and saddle points, Method of Lagrange multipliers. Differentiation underIntegral sign, Jacobians and transformations of coordinates. [8Hrs]

Unit II

Ordinary Differential Equations (ODEs): Basic Concepts. Geometric Meaning of y'= f(x, y). Direction Fields, Euler's Method, Separable ODEs. Exact ODEs. Integrating Factors, Linear ODEs. Bernoulli Equation. Population Dynamics, Orthogonal Trajectories. Homogeneous Linear ODEs with Constant Coefficients. Differential Operators. Modeling of Free Oscillations of a Mass–Spring System, Euler–Cauchy Equations. Wronskian, Nonhomogeneous ODEs, Solution by Variation of Parameters. Power Series Method for solution of ODEs: Legendre's Equation. Legendre Polynomials, Bessel's Equation, Bessels's functions Jn(x) and Yn(x). Gamma Function [12Hrs]

Unit III

Linear Algebra: Matrices and Determinants, Gauss Elimination, Linear Independence. Rank of a Matrix. Vector Space. Solutions of Linear Systems and concept of Existence, Uniqueness, Determinants. Cramer's Rule, Gauss–Jordan Elimination. The Matrix Eigenvalue Problem.

Determining Eigenvalues and Eigenvectors, Symmetric, Skew-Symmetric, and Orthogonal Matrices.Eigenbases. Diagonalization. Quadratic Forms.Cayley – Hamilton Theorem (without proof) [10Hrs]

Unit IV

Vector Calculus: Vector and Scalar Functions and Their Fields. Derivatives, Curves. Arc Length. Curvature. Torsion, Gradient of a Scalar Field. Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field, Line Integrals, Path Independence of Line Integrals, Double Integrals, Green's Theorem in the Plane, Surfaces for Surface Integrals, Surface Integrals, Triple Integrals, Stokes Theorem. Divergence Theorem of Gauss. [10Hrs]

Textbooks:

1. *Advanced Engineering Mathematics* by Erwin Kreyszig, John Wiley, 10th Ed., 2011.
2. *Mathematical Methods for Physics and Engineering*, by K. F. Riley, M. P. Hobson and S. J. Bence, CUP, 2013. (for Unit I)

References:

1. *Engineering Mathematics* by K.A. Stroud withDexter J. Booth, Macmillan, 2020.

2. *Advanced Engineering Mathematics* by Larry Turyn, Taylor and Francis, 2014.
3. *Advanced Engineering Mathematics* by Dennis G. Zill, Jones & Bartlett Learning, 2018.
4. *Advanced Engineering Mathematics with MATLAB* by Dean G. Duffy, Taylor and Francis, 2017.
5. *Advanced Engineering Mathematics* by Merle C. Potter, Jack L. Lessing, and Edward F. Aboufadel, Springer (Switzerland), 2019.