BAPATLA ENGINEERING COLLEGE:: BAPATLA

(Autonomous)

NUMERICAL METHODS AND ADVANCED CALCULUS

I B. Tech. II Semester 20DS201/MA02

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Solve algebraic, transcendental and system of linear equations with the help of numerical methods.
➢	Apply the techniques of numerical integration whenever and wherever routine methods are not applicable and solve the first order ordinary differential equations numerically with the given initial condition using different methods.
➢	Evaluate double and triple integrals and apply them to find areas and volumes.
➢	Evaluate the line, surface and volume integrals and learn their inter-relations and applications.

Course Outcomes: After studying this course, the students will be able to

CO-1	Solve non-linearequations and system of linear equations with the help of Numerical techniques.
CO-2	Solve the first order ordinary differential equations numerically with the given initial condition.
CO-3	Findthe area and volume of plane and three dimensional figures using multiple integrals.
CO-4	Apply vector integral theorems toobtain the solutions of engineering problems involving circulation, flux, and divergence in vector fields.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1	3	3	2	-	-	-	-	-	-	-	-	2	-	3	-
CO-2	3	3	2	-	-	-	-	-	-	-	-	2	-	3	-
CO-3	3	3	2	-	-	-	-	-	-	-	-	2	-	2	-
CO-4	3	3	2	-	-	-	-	-	-	-	-	2	-	3	-

UNIT-1 (12 Hours)

Numerical Solution of Equations: Introduction; Solution of algebraic and transcendental equations: Bisection method, Method of false position, Newton-Raphson method; Useful deductions from the Newton-Raphson formula; Solution of linear simultaneous equations; Direct methods of solution: Gauss elimination method, Gauss-Jordan method, Factorization method; Iterative methods of solution: Jacobi's iterative method, Gauss-Seidel iterative method.
[Sections:28.1; 28.2; 28.3; 28.5; 28.6; 28.7.1;28.7.2].

UNIT-2	(12 Hours)
Finite differences and Interpolation: Finite differences: Forward differences, Backward differences; Newton's interpolation formulae: Newton's forward interpolation formula, Newton's backward interpolation formula; Interpolation with unequal intervals; Lagrange's interpolation formula; Divided differences; Newton's divided difference formula; Numerical integration; Trapezoidal rule; Simpson's one-third rule; Simpson's three-eighth rule; Numerical solution of ODE's: Introduction; Picard's method; Euler's method; Runge-Kutta method. [Sections:29.1; 29.1-1; 29.1.2; 29.6; 29.9; 29.10; 29.11; 29.12; 30.4; 30.6; 30.7; 30.8; 32.1; 32.2; 32.4; 32.7].	
UNIT-3	(12 Hours)
Multiple Integrals: Double integrals; Change of order of integration; Double integrals in polar coordinates; Area enclosed by plane curves; Triple integrals; Volumes of solids: Volume as Triple integral, Change of variables. [Sections: 7.1; 7.2; 7.3; 7.4; 7.5; 7.6.2; 7.7.2].	
UNIT-4	(12 Hours)
Vector calculus and its Applications: Scalar and vector point functions; Del applied to scalar point functions-Gradient: Definition, Directional derivative; Del applied to vector point functions: Divergence, Curl; Line integral; Surfaces: Surface integral, Flux across a surface; Green's theorem in the plane (without proof); Stokes theorem (without proof); Gauss divergence theorem(without proof). [Sections: 8.4; 8.5; 8.5.1; 8.5.3; 8.6; 8.11.1; 8.12.2; 8.12.3; 8.13; 8.14; 8.16]	

Text Books :	B.S.Grewal, "Higher Engineering Mathematics", 44th edition, Khanna publishers, 2017.
References :	[1] Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. [2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.