KALASALINGAM UNIVERSITY

ANAND NAGAR, KRISHNANKOIL – 626126

COURSE PLAN

SUB AND CODE	**:**	**Numerical Methods / MAT211**
SEM/BRANCH	**:**	**IV/ CIVIL, EEE, E&I, Mech & Auto**
NAME OF THE STAFF	**:**	

PRE-REQUISITE:

MAT103, MAT104, MAT202 Calculator operations

OBJECTIVES:

At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses are summarized as follows:

1. The roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and eigenvalue problem of a matrix can be obtained numerically where analytical methods fail to give solution.
2. When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.
3. The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.
4. Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

COURSE LEARNING OUTCOMES AND END USE

1. Students can solve algebraic and transcendental equations, system of linear equations by various numerical techniques.
2. Students can interpolate with various techniques.
3. Students can numerically find the value of differentiation, integration.
4. Students can solve Initial Value Problems and Boundary value problems numerically.

TEXT BOOKS

1. Kreyszig, E., Advanced Engineering Mathematics, John Wiley and Sons (Asia) Limited, Singapore, 8th Edn. , 2001.
2. Arumugam, S., Thangapandi Isaac, A., Somasundaram, A., Numerical Methods, Scitech Publications (India) Pvt. Ltd., Chennai, 2nd Edn., Reprint 2006, 2001.

S. No.	Topic	Ref. Book	No. of periods	Cum. Hours
	Solution of Equations and Eigen Value Problems			
1	Iterative method.	T2	1	1
2	Newton-Raphson method for single variable.	T2	1	2
3	Newton-Rephson method for simultaneous equations with two variables.	T2	1	3
4	Direct method: Solution of linear system by Gaussian elimination method	T2	1	4
5	Solution of linear system by Gauss-Jordan method	T2	1	5
6	Iterative method: Gauss Jacobi and Gauss-Seidel methods	T2	2	7
8	Eigenvalue of a matrix by power method	T2	2	9
	INTERPOLATION			
9	Newton's forward difference formula.	T2	1	10
10	Newton's backward difference formula.	T2	1	11
11	Newton's divided difference formula.	T2	2	13
12	Lagrangian Polynomials	T2	3	16
13	Stirling's Central difference formula.	T2	2	18
	Numerical Differentiation and Integration			
14	Numerical differentiation by interpolation polynomial.	T2	2	20
15	Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules .	T2	3	23
16	Two and Three point Gaussian quadrature formula.	T2	2	25
17	Double integrals using trapezoidal and Simpson's rule.	T2	2	27
	INITIAL VALUE PROBLEMS			
18	Single step methods: Taylor series method	T2	2	29
19	Euler and modified Euler methods	T2	2	31
20	Fourth order Runge – Kutta method for solving first and second order equations	T2	3	34
21	Multistep methods: Milne's predictor and corrector method.	T2	2	36
	BOUNDARY VALUE PROBLEMS			
22	Finite difference solution of second order ordinary differential equation	T2	1	37
23	Finite difference solution of one dimensional heat equation by explicit method	T2	2	39
24	Finite difference solution of one dimensional heat equation by implicit method	T2	2	41
25	One dimensional wave equation	T2	2	43
26	Two dimensional Laplace and Poisson equations	T2	2	45

TEST	TOPIC NO
1	1 – 13
2	14 – 21

HOD /Mathematics **Staff in Charge**