Shri G. S. Institute of Technology and Science
Department of Applied Mathematics and Computational Science
M.Sc. Applied Mathematics, Semester I
MA 94105: COMPUTER AIDED NUMERICAL ANALYSIS

Total No. of Units: 5 Total No. of Lectures: 40

LECTURE PLAN

S.No.	TOPICS	No. of Lectures
	UNIT – I	
1.	Numerical Analysis and Numerical Methods, Numerical computing process, Approximations and errors in computing, and the taxonomy of errors.	02
2.	Errors classification, error approximation, different measurements of numerical errors, Errors in numerical computations and, errors in the approximation of a function.	02
3.	Numerical stability, ill-condition and convergence, numerical algorithm and Numerical Flow Charts.	02
	UNIT – II	
4.	Different forms of mathematical equations, Basic properties of equations, Existence of imaginary roots, Initial approximation, and Graphical solution of equations.	01
5.	Solution of Algebraic and Transcendental Equations: Bisection (or Bolzano) method, method of false position, Newton Raphson method.	03
6.	Solution of Simultaneous algebraic equations: Direct methods- Gauss Elimination method Gauss Jordan method	02
7.	Solution of Simultaneous algebraic equations: Iterative methods-Jacobiôs method, Gauss Seidal method.	02
	UNIT – III	
8.	Calculus of finite differences: definitions, forward and backward differences, properties of forward difference operator, difference table, Factorial polynomial and its differences. Properties of operators and relation between them.	02
9.	Interpolation: Missing term interpolation, interpolation with equal intervals, Newton-Gregory forward and backward interpolation.	02
10.	Interpolation with unequal intervals, Central difference formula, Lagrange interpolation formula	02
11.	Numerical differentiation, first, second and third derivatives, using forward and backward interpolation formula	02

12.	Numerical Integration: derivation of general quadrature formula, deriving Trapezoidal rule, Simpsonôs one-third and three-eighth rules from quadrature formula.	02
	UNIT – IV	
13.	Definition and formation of difference equations, Linear difference equations with constant coefficient	02
14.	Solution of difference equations, Rules for finding Complimentary functions and solutions based on them	02
15.	Solution of difference equations, Rules for finding particular integral, four cases and solutions based on them	02
16.	Difference equations reducible to linear form. Simultaneous difference equations with constant coefficient.	02
	UNIT – V	
17.	Numerical solution of Ordinary Differential Equations: Initial value problem, Eulerôs method, Picardôs method, Taylorôs method, modified Eulerôs method	02
18.	Numerical solution of Ordinary Differential Equations: Runge method, Runge-Kutta method, Adams-Bashforth method, Milneôs method	02
19.	Numerical solution of Partial Differential Equations: Classification of second order equations, finite difference approximations to partial derivatives.	02
20.	Numerical solution of Partial Differential Equations: Elliptic, Parabolic and Hyperbolic equations	02

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Lecture Plan

MA 94106: Computer Architecture

Total No. Of Units : 5

Total No. Of Lectures : 40

Unit No.	No. of Lectures	Intended Topic Covered
I	**2**	Introduction to CA , Number system
	1	Von Neumann Model , Digital devices : Logic gates
	2	flip flops
	2	Logic Design : Boolean Algebra , K-map , Method of simplification of Logic expression
	2	Combinational & Sequential circuits
II	**1**	CPU Organization : ALU , Control unit , Registers
	1	Memory organization, memory properties
	2	Associative memory, Cache memory
	1	Machine language level, instruction types
	2	Input Output Organization : I/O interface . Modes of transfer.
III	**1**	Memory mapped I/O and I/O mapped I/O
	2	Concepts of interrupts and DMA
	2	I/O processors
	2	Concept of hardwired and micro programmed control instruction.
IV	**1**	Parallel processing
	2	Interconnection Structure
	2	Interprocessor Arbitration : Serial , Parallel and Dynamic arbitration Procedure
	2	Interprocessor Communication and Synchronization
	1	Cache Coherence.
V	**3**	Pipeline processing : Concepts , Arithmetic and Instruction Pipeline
	2	Vector and Array processing : vector operation , matrix multiplication
	2	Memory interleaving, Attached array Processor, SIMD Array Processor
	2	Comparison of RISC and CISC.

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Lecture Plan

MA 94108: Advance Discrete Mathematics

Total No. Of Units: 5

Total No. Of Lectures: 40

Unit No.	No. of Lectures	Intended Topic Covered
I	**2**	Formal Logic : Basic preliminaries Sets , functions , relations(equivalence relations and poset) for logic
	1	Symbolic representation and tautologies , Quantifiers
	2	Predicates, Propositional and Predicate calculus, Proofs & method of proofs
	3	Algebra of Boolean expression , Logic gates and circuits, Karnaugh maps
	1	Lattices, Distributive lattice
II	**1**	Graph Theory: Definition of (Undirected) Graphs, Paths, Circuits, Cycles & Subgraphs, Degree of Vertex , Connectivity, Complete regular and bipartite graphs and Complete Bipartite Graphs
	1	Kuratowskis Theorem (Statement only) and its uses, planer graphs and their properties
	2	Eulerôs formula for connected Planer Graphs, Graph colorings, Eulerôs Theorem on the existence of Eulerian paths and circuits
	2	Trees and Binary Trees, Spanning Trees, Cut-sets, Minimal Spanning Trees
	1	Directed Graphs, Indegree and Outdegree of a vertex, weigted undirected graphs, Matrix representation of Graph
III	**1**	Introduction to languages
	1	Grammars
	4	FSM & Automata
IV	**3**	Algebra: Groups:-Review of Basic Concepts, Normal group, Cyclic group, Permutation group
	2	Direct product , Conjugacy relation, Normalizer, counting principle(Th.2.4)[7], Sylowôs Theorem
	4	Rings & Modules:-Some basic concepts, Algebra over fields, ideals, Minimal, Maximal & prime ideals, PID and UFD, Euclidean domain, Polynomial rings, definition of modules
	2	Notherian and Artin & Rings:- Hilbert Basis Theorem
V	**3**	Vector space:- Review of Basic Concepts, Canonical forms
	2	Field:- Extension field, Algebraic & Transcendental Extension field, roots of Polynomial, Finite field
	2	Elements of Galios theory, fundamental theorem & Applications.

Shri G. S. Institute of Technology and Science
Department of Applied Mathematics and Computational Science
M.SC-I Semester
MA94109: Ordinary and Partial differential equation.
Total no. of Units: 5
LECTURE PLAN July-Dec. 2021

S.No.	Topic	No. of Lecture No.
	UNIT-1	
1	Initial & boundary value problem,Picardôs iteration,Lipschitz condition, Sufficient condition in terms of partial derivatives.	3
2	Example of Lipschitzian and Non- Lipschitzian functions, Picardôs theorem for local existence and uniqueness of solutions of an initial value problem.	3
3	Problem of first order which solved for the derivative, examples of problem without solution and of equations where picardôs iteration not converge.	2
	UNIT-II	
4	Existence & Uniqueness for ordinary differential equation, Wornskian	3
5	Linear independence, Initial value problem for nth order differential equation.	**3**
6	Linear equation with variable cofficients, Lipschitz condition	2
	UNIT-III	
7	Fundamental concepts of partial diff. equation,classification of IInd order PDE, Canonical forms of Hyperbolic, Parabolic and Elliptic equation	2
8	**E**lliptic differential equation , Laplace and Poisson equation, Dirichlet problem for a rectangle, Neumann problem for a rectangle.	**2**
9	Parabolic diff. equation: Diffusion equation, Dirac Delta function	2
10	Hyperbolic diff. equation: Wave equation, Vibrating string Variable separable solution	**2**
	UNIT-IV	
11	Method of separation of variable, Laplace, Diffusion, and wave equation in Cartesian, cylindrical and spherical polar coordinate	**3**
12	Boundary value problem for vibration of string and heat diffusion in a finite rod	3
13	Claasification of integral equation: Fredhlom integral equation, Volterra integral equation.	1
14	Relation between diff. and integral equation.	1
	UNIT-V	
15	Greenôs function: Definition, example , Greenôs function for Laplace equation.	3
16	The method of images, the eigen function method	3
17	Green function for the wave equation- Helmholtz Theorem.	2