UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

Syllabus

for

B.TECH. COMPUTER SCIENCE AND ENGINEERING

of

Second Year

(Effective from the Session: 2014-15)

B.TECH COMPUTER SCIENCE AND ENGINEERING

STUDY & EVALUATION SCHEME

2nd Year SEMESTER III

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/ NOE-031 to NOE-039	Mathematics III/Science Based Open Elective	3	1	0	30	20	50	100	150	4
2	NEC 309	Digital Logic Design	3	1	0	30	20	50	100	150	4
3	NCS 301	Data Structures Using C	3	1	0	30	20	50	100	150	4
4	NCS 302	Discrete Structures And Graph Theory	3	1	0	30	20	50	100	150	4
5	NHU301/ NHU302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NCS 303	Computer Based Numerical And Statistical Techniques	2	1	0	15	10	25	50	75	3
	AUC-001/ AUC-002	*Human Values & Professional Ethics/ Cyber Security*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING											
7	NEC 359	Digital Logic Design Lab	0	0	3	10	10	20	30	50	1
8	NCS 351	Data Structures Using C Lab	0	0	3	10	10	20	30	50	1
9	NCS 353	Numerical Techniques Lab	0	0	2	10	10	20	30	50	1
10	NCS 355	Advance Programming Lab	0	0	2	10	10	20	30	50	1
11	NGP 301	GP						50		50	
		TOTAL	18	5	10					1000	25

Science Based Open Elective:

NOE031 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE032 Nano Sciences
NOE033 Laser Systems and Applications
NOE034 Space Sciences
NOE035 Polymer Science & Technology
NOE036 Nuclear Science
NOE037 Material Science
NOE038 Discrete Mathematics
NOE039 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

B.TECH COMPUTER SCIENCE AND ENGINEERING

STUDY & EVALUATION SCHEME

2nd Year SEMESTER IV

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-041 to NOE-049/ NAS-401	Science Based Open Elective/ Mathematics III	3	1	0	30	20	50	100	150	4
2	NHU401/ NHU402	Industrial Psychology /Industrial Sociology	2	0	0	15	10	25	50	75	2
3	NEC-409	Introduction to Microprocessor	3	1	0	30	20	50	100	150	4
4	NCS-401	Operating System	3	1	0	30	20	50	100	150	4
5	NCS-402	Theory Of Automata and Formal Launguage	3	1	0	30	20	50	100	150	4
6	NCS-403	Computer Graphics	2	1	0	15	10	25	50	75	3
7	AUC-002/ AUC-001	*Cyber Security / Human Values & Professional Ethics*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING											
7	NEC-459	Microprocessor Lab	0	0	3	10	10	20	30	50	1
8	NCS 451	Operating System Lab	0	0	3	10	10	20	30	50	1
9	NCS 453	Computer Graphics Lab	0	0	2	10	10	20	30	50	1
10	NCS 455	Functional and Logic Programming Lab	0	0	2	10	10	20	30	50	1
11	NGP-401	GP						50		50	
		TOTAL	18	5	10					1000	25

The details of Science Based Electives are to be provided by The Boards of Studies of Science Subjects; these are common to all branches.

Science Based Open Elective:

NOE-041 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE-042 Nano Sciences
NOE-043 Laser Systems and Applications
NoE-044 Space Sciences
NOE-045 Polymer Science & Technology
NOE-046 Nuclear Science
NOE-047 Material Science
NOE-048 Discrete Mathematics
NOE-049 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

NEC-309: DIGITAL LOGIC DESIGN

Unit-I
Digital Design and Binary Numbers:
Binary Arithmetic, Negative Numbers and their Arithmetic, Floating point representation, Binary Codes, Cyclic Codes, Error Detecting and Correcting Codes, Hamming Codes.
Minterm and Maxterm Realization of Boolean Functions, Gate-level minimization: The map method up to four variable, don't care conditions, SOP and POS simplification, NAND and NOR implementation, Quine Mc-Cluskey Method (Tabular method).
Unit-II
Combinational Logic:
Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Code Converters, Parity Generators and Checkers, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Hazards and Threshold Logic
Unit-III
Memory and Programmable Logic Devices:
Semiconductor Memories, RAM, ROM, PLA, PAL, Memory System design.
Unit-IV
Synchronous Sequential Logic:
Sequential Circuits, Storage Elements: Latches, Flip Flops, Analysis of Clocked Sequential circuits, state reduction and assignments, design procedure.
Registers and Counters: Shift Registers, Ripple Counter, Synchronous Counter, Other Counters.
Unit-V
Asynchronous Sequential Logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.

References:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2.A.K .Singh, "Foundation of Digital Electronics and Logic design",New Age international.
3.M. Rafiquzzaman, "Fundamentals of Digital Logic and Microcomputer Design", Wiley Dreantech Publication.
4.ZVI Kohavi, "Switching and Finite Automata theory" ,Tata McGraw-Hill.
5.C.H Roth,Jr., "Fundamentals of Logic Design", ,Jaico Publishing.
6. Rajaraman & Radhakrishnan, "Digital Logic and Computer Organization",PHI Learning Private Limited, Delhi India.
7. Donald D. Givone, "Digital Principles and Design", Tata MCGraw Hill.
8. Marcovitz:Introduction to logic Design ,Tata Mcgraw-hill Education (India) Pvt. Ltd.

NCS-301: DATA STRUCTURES USING – C

Unit - I
Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off.
Abstract Data Types (ADT)
Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.
Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List .
Unit – II
Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.
Unit – III
Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.
Unit – IV
Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks

Unit – V

Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting.

Search Trees: Binary Search Trees(BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees .

Hashing: Hash Function, Collision Resolution Strategies

Storage Management: Garbage Collection and Compaction.

References :

1. Aaron M. Tenenbaum,YedidyahLangsam and Moshe J. Augenstein "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, "Fundamentals of Data Structures", *Galgotia Publications* Pvt Ltd Delhi India.
3. A.K. Sharma ,Data Structure Using C, Pearson Education India.
4. Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication.
5. Lipschutz, "Data Structures" Schaum's Outline Series, Tata Mcgraw-hill Education (India) Pvt. Ltd .
6. Michael T. Goodrich, Roberto Tamassia, David M. Mount "Data Structures and Algorithms in C++", Wiley India.
7. P.S. Deshpandey, "C and Datastructure", Wiley Dreamtech Publication.
8. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education
9. Berztiss, A.T.: Data structures, Theory and Practice :, Academic Press.
10. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill.

NCS-302: DISCRETE STRUCTURES AND GRAPH THEORY

Unit-I

Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs,Set Identities.

Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.

Functions: Definition, Classification of functions,Operations on functions, Recursively defined functions.

Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases.

Unit-II

Algebraic Structures: Definition, Groups, Subgroupsand order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo n.

Unit-III

Partial order sets: Definition, Partial order sets,Combination of partial order sets, Hasse diagram.

Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete Lattice,Morphisms of lattices.

Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplificationof Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits

Unit-IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference ,Natural Deduction.

Predicate Logic: First order predicate, well formedformula of predicate, quantifiers, Inference theory of predicate logic.

Unit-V

Trees : Definition, Binary tree, Binary tree traversal, Binary search tree.

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring .

Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References :

1. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. Y. N. Singh, "Discrete Mathematical Structures", Wiley India, New Delhi, First Edition, August 2010.
4. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,

5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI Learning Private Limited, Delhi India.
6. Biswal ,"Discrete Mathematics and Graph Theory, PHI Learning Private Limited, Delhi India.
7. Goodaire and Parmenter," Discrete Mathematics with Graph Theory", PHI Learning Private Limited, Delhi India.
8. Lipschutz "Discrete Mathematics" Mc Graw Hill
9. Deo N., "Graph Theory with Applications to Engineering and Computer Science", PHI Learning Private Limited, Delhi India

NCS-303: Computer Based Numerical and Statistical Techniques

- **Unit –I :**
  Computer Arithmetic and Errors: Floating Point Arithmetic, Machine epsilon, Round off Error, Chopping Error, Truncation Error, Associative and Distributive Law in Floating Point arithmetic, Inherent Error, Error propagation, Numerical Instability
  Roots of Equation: Secant Method, Newton Raphson Method and Fixed point Iteration Methods for Simple roots and derivation of their rate of convergence, Aitken Acceleration of Convergence, Modified Newton Raphson Method for Multiple roots, Birge-Vieta Method for Polynomials, Bairstrow Method for quadratic factors, Computer Algorithms of these methods.

- **Unit –II**
  Interpolation: Algorithms and Error Analysis of Lagrange and Newton divided difference interpolations, Relationship in various difference operators, Piecewise Linear Interpolation, Cubic Spline Interpolation, Natural Spline, Chebshev Polynomial Approximations, Lanczos Economization of Power Series
  Curve fitting: Linear and Non Linear Least Squares Approximation, ill Conditioning in Least Squares Methods, Gram-Schmidt Process of Orthogonalization. Computer Algorithms of Least Square Curve Fitting

- **Unit – III**
  Differentiation: Methods based on Interpolation and Finite Differences, Richrdson Extrapolation
  Integration: Error Analysis of Trepezoidal and Simpson Methods, Newton Cotes Integration Methods, Guassian Integration Methods: Guass Legendre Method, Lobatto Integration Method and Radau Integration Method, Error Terms in Integration Methods

- **Unit – IV**
  Solution of Simultaneous Linear Algebraic Equations: Guass Elimination Method, ill Conditioned Systems, Condition Number, Successive Over Relaxation Method, Rate of Convergence
  Solution of Ordinary Differential equations: Single Step Methods-Runge-Kutta Second Order, Third Order and Fourth Order Methods, Multi Step Method-Predictor- Corrector Method
  Statistical Techniques: Statistical Hypotheses, Test of Hypotheses, Type-I and Type-II Errors, Level of Significance, Test involving Normal Distribution

  Recommended Books:
  - *Numerical Methods: M.K. Jain, S.R.K. Iyenger and R.K. Jain*
  - *Applied Numerical Analysis: Curtis F. Gerald and Patrick O. Wheatley*
  - *Schaum's Outline of Theory and Problems of Statistics: Murray R. Spiegel*

NEC-359: LOGIC DESIGN LAB

Objective: To understand the digital logic and create various systems by using these logics.

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-351: DATA STRUCTURE USING C LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-353: NUMERICAL TECHNIQUES LAB

Write Programs in 'C' Language:

1. To deduce error involved in polynomial equation.
2. To Find out the root of the Algebraic and Transcendental equations using Bisection, Regula-falsi, Newton Raphson and Iterative Methods. Also give the rate of convergence of roots in tabular form for each of these methods.
3. To implement Newton's Forward and Backward Interpolation formula.
4. To implement Gauss Forward and Backward, Bessel's, Sterling's and Evertt's Interpolation formula
5. To implement Newton's Divided Difference and Langranges Interpolation formula.
6. To implement Numerical Differentiations.
7. To implement Numerical Integration using Trapezoidal, Simpson 1/3 and 0Simpson 3/8 rule.
8. To implement Least Square Method for curve fitting.
9. To draw frequency chart like histogram, frequency curve and pie-chart etc.
10. To estimate regression equation from sampled data and evaluate values of standard deviation, t-statistics, regression coefficient, value of R^2 for atleast two independent variables.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-355: ADVANCE PROGRAMMING LAB

LIST OF EXPERIMENTS:

1. Programs using Functions and Pointers in C
2. Programs using Files in C
3. Programs using Classes and Objects
4. Programs using Operator Overloading
5. Programs using Inheritance, Polymorphism and its types
6. Programs using Arrays and Pointers
7. Programs using Dynamic memory allocation
8. Programs using Templates and Exceptions
9. Programs using Sequential and Random access files

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NEC 409: INTRODUCTION TO MICROPROCESSOR

UNIT I

Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU,Example of an 8085 based computer, Memory interfacing.

UNIT II

Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing.

UNIT III

Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, counter and time delays, Illustrative program: Hexadecimal counter, zero-to-nine, (module ten) counter, generating pulse waveforms, debugging counter and time delay, Stack, Subroutine, Restart, Conditional call and return instructions, Advance subroutine concepts, The 8085 Interrupts, 8085 vector interrupts.

UNIT IV

Program: BCD-to-Binary conversion, Binary-to-BCD conversion, BCD-to-Seven segment code converter, Binary-to-ASCII and ASCII-to-Binary code conversion, BCD Addition, BCD Subtraction, Introduction to Advance instructions and Application, Multiplication, Subtraction with carry.

UNIT V

8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.

Introduction to 8086 microprocessor: Architecture of 8086 (Pin diagram, Functional block diagram, Register organization).

References :

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.

2. * Douglas V. Hall, "Microprocessors and Interfacing", , Tata McGraw Hill.

3. Yu-cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India.

4. Barry B. Brey, "The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, PentiumPro Processor, PentiumII, PentiumIII, Pentium IV, Architecture, Programming & Interfacing", Eighth Edition, Pearson Prentice Hall, 2009.

5. Peter Abel, "IBM PC Assembly language and programming", Fifh Edition, Prentice Hall of India Pvt. Ltd.

6. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Pearson education, .

NCS-401: OPERATING SYSTEM

Unit – I

Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.

Unit – II

Concurrent Processes: Process Concept, Principle ofConcurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

Unit – III

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

Unit – IV

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

Unit – V

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, Filesystem implementation issues, File system protection and security.

References :

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley
2. SibsankarHalder and Alex A Aravind, “Operating Systems”, Pearson Education
3. Harvey M Dietel, “ An Introduction to Operating System”, Pearson Education
4. D M Dhamdhere, “Operating Systems : A Concept basedApproach”, McGraw Hill.
5. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education”.
6. Stuart E. Madnick & John J. *Donovan. Operating Systems.* McGraw Hill.

NCS-402: THEORY OF AUTOMATA AND FORMAL LANGUAGES

Unit – I

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition tabl e, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transi ion, Language of NFA, Equi valence of NFA and DFA, Minimization of Finite Automata, Distinguis hing one string from other, Myhill-Nerode Theorem

Unit – II

Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen’s Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

Unit – III

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammer, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Memership, Pumping lemma for CFLs.

Unit – IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA

Unit – V

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computerof Integer functions, Universal TM, Church’s Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory

References :

1. Hopcroft, Ullman, “Introduction to Automata Theory,Languages and Computation”, Pearson Education .
2. K.L.P. Mishra and N.Chandrasekaran, “Theory of Computer Science : Automata, Languages and Computation”, PHI Learning Private Limited, Delhi India.
3.Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
4. Y.N.Singh “Mathematical Foundation of Computer Science”, New Age International.
5. Papadimitrou, C. and Lewis, C.L., “Elements of the Theory of Computation”, PHI Learning Private Limited, Delhi India.
6. K.Krithivasan and R.Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education.
7. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd.
8. Micheal Sipser, “Introduction of the Theory and Computation”, Thomson Learning.

NCS-403: COMPUTER GRAPHICS

Unit – I

Introduction and Line Generation:Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid pointcircle generating algorithm, and parallel version of these algorithms.

Unit – II

Transformations:Basic transformation, Matrix representations and homogenious coordinates, Composite transformations, Reflections and shearing.
Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms-Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.
Unit – III
Three Dimensional: 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.
Unit – IV
Curves and Surfaces:Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.
Hidden Lines and Surfaces:Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

References :

1. Donald Hearn and M Pauline Baker, “Computer Graphics C Version”, Pearson Education
2. Amrendra N Sinha and Arun D Udai,” Computer Graphics”, Tata MCGraw Hill.
3. Donald Hearn and M Pauline Baker, “Computer Graphics with OpenGL”, Pearson education
4. R.K. Maurya, “Computer Graphics ” Wiley Dreamtech Publication.
5. Rogers, “ Procedural Elements of Computer Graphics”, McGraw Hill
6. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI Learning Private Limited, Delhi India.
7.Foley, Vandam, Feiner, Hughes – “Computer Graphics principle”, Pearson Education.
8. W. M. Newman, R. F. Sproull – “Principles of Interactive computer Graphics” – Tata MCGraw Hill.

NEC-459: MICROPROCESSOR LAB

1. To study 8085 microprocessor system
2. To study 8086 microprocessor system
3. To develop and run a programme to find out largest and smallest number
4. To develop and run a programme for converting temperature from F to C degree
5. To develop and run a programme to compute square root of a given number
6. To develop and run a programme for computing ascending/descending order of a number.
7. To perform interfacing of RAM chip to 8085/8086
8. To perform interfacing of keyboard controller
9. To perform interfacing of DMA controller
10. To perform interfacing of UART/USART

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-451: OPERATING SYSTEM LAB

1.To implement CPU Scheduling Algorithms
- FCFS
- SJF
- SRTF
- PRIORITY
- ROUND ROBIN

2. Simulate all Page Replacement Algorithms
- FIFO
- LRU

3. Simulate Paging Technique of Memory Management

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-453: COMPUTER GRAPHICS LAB

1. To implement DDA algorithms for line and circle.
2. To implement Bresenham's algorithms for line, circle and ellipse drawing
3. To implement Mid Point Circle algorithm using C .
4. To implement Mid Point Ellipse algorithm using C .
5. To perform 2D Transformations such as translation, rotation, scaling, reflection and sharing.
6.To implement Cohen–Sutherland 2D clipping and window–viewport mapping.
7.To implement Liang Barksy Line Clipping Algorithm.
8.To perform 3D Transformations such as translation, rotation and scaling.
9.To convert between color models.
10.To perform animation using any Animation software
11.To perform basic operations on image using any image editing software
12.To draw different shapes such as hut,face ,kite ,fish etc.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/shefeels in a justified manner.

NCS-455: FUNCTIONAL AND LOGIC PROGRAMMING LAB

Program in SML- NJ or CAML for following:

1. To implement Linear Search.
2. To implement Binary Search.
3. To implement Bubble Sorting.
4. To implement Selection Sorting.
5. To implement Insertion Sorting.

Implement using LISP

6. Write a function that compute the factorial of a number.(factorial of 0 is 1, and factorial of n is n*(n-1)*...1.Factorial is defined only for integers greater than or equal to 0.)
7. Write a function that evaluate a fully parenthesized infix arithmetic expression . For examples, (infix (1+(2*3))) should return 7.
8. Write a function that perform a depth first traversal of binary tree. The function should return a list containing the tree nodes in the order they were visited.
9. Write a LISP program for water jug problem.
10. Write a LISP program that determines whether an integer is prime.
11. Write a PROLOG program that answers questions about family members and relationships includes predicates and rules which define sister,brother,father,mother,grandchild,grandfather and uncle. The program should be able to answer queries such as the following :

    - father(x,Amit)
    - grandson(x,y)
    - uncle(sumit,puneet)
    - mother(anita,x)

Note: The Instructor may add/delete/modify/tune experiments, wherever he/shefeels in a justified manner.