TECHNO INDIA UNIVERSITY
WESTBENGAL

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

4-Years B.Tech. Curriculum and Syllabus for Computer Science and Engineering (CSE)

Third Semester

S. No	Course Code	Course Title	Contact Hrs. / Week			Credit
			L	T	P	
THEORY						
1	TIU-UEN-T201	Career Advancement & Skill Development- III	2	1	0	3
2	TIU-UMA-T209	Discrete Structure	3	0	0	3
3	TIU-UEC-T205	Signals And Networks	3	0	0	3
4	TIU-UEC-T207	Switching Circuits And Logic Design	3	0	0	3
5	TIU-UCS-T201	Data Structure & Algorithms	3	0	0	3
6	TIU-UCS-T203	Computer Organization	3	0	0	3
PRACTICAL						
1	TIU-UEC-L205	Signals And Networks Lab	0	0	3	2
2	TIU-UEC-L207	Switching Circuits And Logic Design Lab	0	0	3	2
3	TIU-UCS-L201	Data Structure & Algorithms Lab	0	0	3	2
4	TIU-UCS-L203	Computer Organization Lab	0	0	3	2
SESSIONAL						
1	TIU-UES-S299	Entrepreneurship Skill Development-III	0	0	3	2
TOTAL CREDIT						28

Approved By:
External Expert VC Registrar Dean of Academics Mentor of the Deptt. HOD

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Syllabus

Career Advancement & Skill Development- III
TIU-UEN-T201

L-T-P: 2-1-0 **Credit: 3**

DISCRETE STRUCTURE
TIU-UMA-T209

L-T-P: 3-0-0 **Credit: 3**

Sets, Relations & Functions: Sets, subsets & operations on sets, finite and infinite sets. Relations & properties of relations, equivalence, compatibility, partial order relation, Poset, lub, glb, maximal & minimal elements of a poset. Functions, inverse functions, composition of functions, recursive functions.

Mathematical Logic: Logic operators, Truth tables, Normal Forms, Propositional Calculus, Theory of inference and deduction, Predicate Calculus.

Boolean Algebra: Boolean functions, min & max terms, simplification of Boolean function with Karnaugh Map & Quine McClusky method, Lattices.

Number Theory: Greatest Common Divisors, Euclidean Algorithms, Fibonacci Numbers, Complexity of Euclidean Algorithms, Congruencies and Equivalence Relations, Public Key Encryption Schemes, Dividends.

Groups & Subgroups: Semi-groups, Free semi-groups, Monoids, Group axioms, permutation groups, subgroups, cosets, normal subgroups, sequential machines, error correcting codes, modular arithmetic grammars.

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Combinatorics & Recurrence Relations: Basic Theorems on permutation and combinations. Pigeon hole principle, principle of inclusion and exclusion. Ordinary & exponential generating functions, recurrence relation, solving recurrence relation.

Graph Theory: Basic definitions trees and graphs, connectivity of a graph, cut sets, cycles, Hamiltonian graphs, Trees, different characterization of trees, bipartite graphs, Planar and Dual graphs. Euler theorem. Algorithms on graphs and trees like Breadth first search & Depth first search, Dijkastra's algorithm for shortest path, Floyd's algorithm for all pair shortest paths, Kruskal's and Prim's algorithm for Minimum cost spanning tree.

Finite State Machines and Languages: Languages, Representation of languages and Grammars, Finite State Machines, Regular Languages, Simplification of Machines.

Recommended Books

Main Reading:

1. Kolman, Busby & Ross "Discrete Mathematical Structures"
2.Trembly. J.P. & Manohar. P "Discrete Mathematical Structures with Applications to computer Science"
3.C.L.Liu, "Elements of Discrete Mathematics"

Supplementary Reading:

1. M.O. Albertson nad Joan P. Hutchinson, "Discrete Mathematics with Algorithms"
2. N.Ch. S.N. Iyengar, V.M. Chandrasekaran, K.A. Vanatesh, P.S. Arunachalam, "Discrete mathematics"
3. Peter Linz, "an Introduction to Format languages and Auomata"
4. Narsingh Deo "Graph Theory with Appl. To Engg. & Comuter .Sc"
5. M. Lipson & : Lipshutz, "Discrete Mathematics"
6. Babu Ram, Discrete Mathematics, PEARSON
7. Grimaldi & Ramana, Discrete and Combinatorial Mathematics, 5e , PEARSON

SIGNALS AND NETWORKS

TIU-UEC-T205

L-T-P: 3-0-0 **Credits: 3**

Laplace Transform: Concept of complex frequency, transform of standard periodic and non-periodic waveforms. Independent and dependent sources and equivalence of sources. Circuit elements and their transformed equivalents, treatment of mutual couplings. Transient and steady state response of RL, RC, LC and RLC circuits in transient with or without stored energy – solutions in t & s domains. Concept of natural frequency and damping. Sketching transient response, determination of peak values. Practical

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applications. Loop and node variable analysis of transformed circuits. Applications of network theorems in steady state & transient domains. Fourier Transform.

Graph of network: Concept of tree branch, tree link, tie set and cut set. Various incidence matrices and their properties, loop currents and node-pair potentials, formulation of equilibrium equations on the loop and node basis. Network functions, driving point and transfer functions, two port networks, impedance and admittance parameters, transmission and inverse transmission parameters, hybrid and inverse hybrid parameters. Series, parallel and cascade connections of two port networks.

Recommended Books:

Main Reading:

1. D. Roy Choudhury, Networks and Systems, New Age International Publishers.

2. Hayt, Kemmerley & Durbin, Engineering Circuit Analysis, McGraw Hill.

Supplementary Reading:

1. Salivahanan And P. Kumar**,** Circuit Theory, Vikas Publishing House

SWITCHING CIRCUITS AND LOGIC DESIGN

TIU-UEC-T207

L-T-P: 3-0-0 **Credit: 3**

Switching Circuits: Logic Families: Ttl, *N*-mos, Cmos, Dynamic Cmos And Pass Transistor Logic (Ptl) Circuits, Inverters And Other Logic Gates, Area, Power And Delay Characteristics, Concepts Of Fan-In, Fan-Out And Noise Margin.

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Switching Theory: Boolean Algebra, Logic Gates, And Switching Functions, Truth Tables And Switching Expressions, Minimization of Completely And Incompletely Specified Switching Functions, Karnaugh Map And Quine-Mccluskey Method, Multiple Output Minimization, Representation And Manipulation of Functions Using Bdds, Two-Level And Multi-Level Logic Circuit Synthesis.

Combinational Logic Circuits: Realization of Boolean Functions Using Nand/Nor Gates, Decoders, Multiplexers. Logic Design Using ROMs, PLAs and FPGAs. Case Studies.

Sequential Circuits: Clocks, Flip-Flops, Latches, Counters And Shift Registers, Finite-State Machine Model, Synthesis of Synchronous Sequential Circuits, Minimization And State Assignment, Asynchronous Sequential Circuit Synthesis.

Asm Charts: Representation Of Sequential Circuits Using Asm Charts, Synthesis Of Output And Next State Functions, Data Path Control Path Partition-Based Design.

Recommended Books:

Main Reading:

1. M. Moris Mano, Michael D. Ciletti, Logic Design, Pearson Education Inc.

2. D. Leach And A. Malvino, Digital Principles And Applications, Mc-Graw Hill Education

Supplementary Reading:

1. Kothari, D P, Nagrath, I J, Basic Electrical Engineering, Tata McGraw-Hill
2. D. Chattopadhyay, P.C. Rakshit, Electronics Fundamentals And Applications, New Age International Publisher
3. Kulshreshtha, Basic Electrical Engineering: Principles And Application, Tata Mcgraw-Hill.
4. Robert. L. Boylestad, Electronic Devices And Circuit Theory, Pearson Education Inc.

DATA STRUCTURE & ALGORITHMS

TIU-UCS-T201

L-T-P: 3-0-0 **Credit: 3**

Basic Concepts of Data Representation: Abstract Data Types, Fundamental and Derived Data Types, Representation, Primitive Data Structures.

Introduction to Algorithm Design and Data Structures: Design and Analysis of Algorithm: Algorithm Definition, Comparison of Algorithms, Top-Down and Bottom Up Approaches to Algorithm Design, Analysis of Algorithm, Complexity Measures in Terms of Time and Space, Structured Approach to Programming.

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Arrays: Representation of Arrays, Single and Multidimensional Arrays, Address Calculation Using Column and Row Major Ordering, Various Operations on Arrays; Application of Arrays Matrix Multiplication, Sparse Polynomial Representation and Addition.

Stacks and Queues: Representation of Stacks and Queues, Using Arrays and Linked-List; Circular Queues Priority Queue and D-Queue; Applications of Stacks, Conversion from Infix to Postfix and Prefix Expressions, Evaluation of Postfix Expression Using Stacks.

Linked Lists: Singly Linked List, Operations on List, Linked Stacks and Queues, Polynomial Representation and Manipulation Using Linked Lists, Circular Linked Lists, Doubly Linked Lists, Generalized List Structure, Sparse Matrix Representation Using Generalized List Structure.

Trees: Binary Tree Traversal Methods, Preorder, In-Order, Post-Order Traversal (Recursive And Non-Recursive), Algorithms for Above Mentioned Traversal Methods; Representation of Trees and Its Applications Binary Tree Representation of a Tree, Conversion of Forest into Tree, Threaded Binary Trees, Lexical Binary Trees, Decision and Game Trees, Binary Search Tree: Height Balanced (AVL) Tree, B-Trees, B+ Tree.

Searching, Sorting and Complexity:

Searching: Sequential and Binary Searches, Indexed Search, Hashing Schemes.
Sorting: Insertion, Selection, Bubble, Quick, Merge, Radix, Shell, Heap Sort.
Comparison of Time Complexity.

Graphs: Graph Representation, Adjacency Matrix, Adjacency Lists, Traversal Schemes, Depth First Search, Breadth First Search.

Recommended Books:

Main Reading:

1. Horowitch and Sahani, Data Structure using C,

2. Lipshutz, Data Structures with C, Mc-Graw Hill.

Supplementary Reading:

1. Robert Lafore, Data Structures And Algorithms In Java, Sams.

2. A.M. Tennenbaum, Y. Langsam And M. J. Augenstein, Data Structures Using C, PHI, 1996.

3. D. E. Knuth, The Art Of Computer Programming-Vol-I & Vol-II, Narosa Publication.

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4. S. Chottopadhyay, D. Ghoshdastider & M. Chottopadhyay, Data Structures Though C Language, First Edition, 2001, BPB Publication.

COMPUTER ORGANIZATION

TIU-UCS-T203

L-T-P: 3-0-0 **Credit: 3**

Basic Functional Blocks of a Computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU - registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study - instruction sets of some common CPUs.

Data Representation: Signed number representation, fixed and floating point representations, character representation. Computer arithmetic - integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication - shift-and-add, Booth multiplier, carry save multiplier, etc. Division - non-restoring and restoring techniques, floating point arithmetic.

CPU Control Unit Design: hardwired and micro-programmed design approaches, Case study - design of a simple hypothetical CPU.

Memory organization: Concept of hierarchical memory organization, Memory interleaving , emiconductor memory technologies, primary memory and concept of cache memory.

Peripheral Devices and Their Characteristics: Input-output subsystems, I/O transfers - program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes - role of interrupts in process state transitions. Performance enhancement techniques

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Recommended Books

Main Reading:

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Elsevier.

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2. Carl Hamachar, Zvonco Vranesic and Safwat Zaky, Computer Organization, McGraw Hill.

3. John P. Hayes, Computer Architecture and Organization, McGraw Hill.

1. William Stallings, Computer Organization and Architecture: Designing for Performance, Pearson Education.

2. Vincent P. Heuring and Harry F. Jordan, Computer Systems Design and Architecture, Pearson Education.

SIGNALS AND NETWORKS LAB

TIU-UEC-L205

L-T-P: 0-0-3 **Credits: 2**

1. **Experimental Verification** of Maximum Power Transfer Theorem and Reciprocity Theorem

2. **Transient Response and Frequency Response of Series R-L-C Circuit**. (I) Determination of Z, A, ABCD and H Parameters of Linear Two Port Network (Ii) Determination The Driving Point Impedance of One Port Network By Frequency Response Method

3. **Study of Active Low Pass and High Pass Filters**: Measurement of Frequency Response Â Attenuation and Phase Characteristics of Butterworth and Sallen Key Filters

4. **Characteristics of A Closed Loop Amplifier**: Closed Loop Gain of The Amplifier with Feedback

5. **Study of Non-Linear Circuit**: Rectifier Diode and Zener Diode Circuits In Series Parallel Combination Determination of Fourier Series Coefficients of A Periodic Signal

SWITCHING CIRCUITS AND LOGIC DESIGN LAB

TIU-UEC-L207

L-T-P: 0-0-3 **Credits: 2**

List of Digital Electronics Experiments:

1. Realization of Not, Or, And, X-or, X-nor Gates Using Universal Gates
2. A) Gray To Binary Conversion & Vice-Versa.
   B) Code Conversion Between Bcd And Excess-3

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3. A) Odd And Even Parity Generation And Checking.
   B) 4-Bit Comparator Circuit

4. Design of Combinational Circuit To Drive Seven-Segment Display
5. Design of Combinational Circuits Using Multiplexer
6. A) Adder/ Subtractor Circuits Using Full-Adder Using Ic And/ Or Logic Gates.
   B) Bcd Adder Circuit Using Ic And/ Or Logic Gates

7. Realization of Rs, Jk, And D Flip Flops Using Universal Logic Gates
8. Realization of Asynchronous Up/Down Counter
9. Realization of Synchronous Mod-N Counter
10. Digital To Analog Conversion Programming Practice

Recommended Books:

Main Reading:

1. H. Taub And D. Schilling, Digital Integrated Electronics, Mcgraw-Hill .
2. Z. Kohavi, Switching And Finite Automata Theory, Tata Mcgraw-Hill.

Supplementary Reading:

1. Randy H. Katz And Gaetano Borriello, Contemporary Logic Design, Prentice Hall of India.
2. Giovanni De Micheli, Synthesis And Optimization of Digital Circuits, Tata Mcgraw-Hill.

DATA STRUCTURE & ALGORITHMS LAB

TIU-UCS-L201

L-T-P: 0-0-3 **Credits: 2**

Lab Assignments Should Include But Not Limited to :
Implementation of Array Operations: Addition, Insertion, Deletion Operations, etc.

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Stacks and Queues: Adding, Deleting Elements, Circular Queue, Adding & Deleting Elements Merging Problem, Evaluation of Expressions Operations On Multiple Stacks & Queues.

Implementation of Linked Lists: Inserting, Deleting, Inverting a Linked List. Implementation of Stacks & Queues Using Linked Lists.

Polynomial Operations: Polynomial Addition, Polynomial Multiplication

Sparse Matrices : Multiplication, Addition.

Tree: Recursive and Non-recursive Traversal of Trees, Threaded Binary Tree Traversal. Avl Tree Implementation, Application of Trees.

Application of Searching and Sorting Algorithms: Linear Search, Binary Search, Bubble Sort, Selection Sort, Merge Sort , Quick Sort, etc.

Hash Tables Implementation: Searching, Inserting and Deleting, Searching and Sorting Techniques.

COMPUTER ORGANIZATION LAB

TIU-UCS-L203

L-T-P: 0-0-3 **Credit: 2**

List of Experiments:

1. Review of the different logic design circuits, e.g.
a) Flip/Flop (RS, JK, D, T)
b) Register (4/8-bit Synchronized Data Transfer)
c) Tri-state logic Gates

2. Familiarity with state of art IC-chips, e.g.
a) Multiplexer, b) Decoder, c) Encoder, d) Counter, e) Shift-Register, f) adder Truth Table verification and clarification from Data-book.

3. Design a BCD adder.

4. Design an Adder/ Subtractor composite unit.

5. Design a carry-look ahead Adder.

6. Design a ripple counter and carry-look ahead counter and assess the complexity of both the circuits.

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7. Use a multiplexer unit to design a composite ALU.

8. Design a multiplex display unit using counter, multiplexer, decoder etc.

9. Design a keyboard Encoder unit in 2 Dimension.

10. Test a RAM chip and cascade two chips for vertical and horizontal expansion. Use wired OR tri-state output interconnection.

11. Use ALU chip for multi-bit arithmetic operation.