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)

Sixth Semester

S. No	Course Code	Course Title	Contact Hrs. / Week			Credit
			L	T	P	
THEORY						
1	TIU-UEN-T300	Career Advancement & Skill Development	2	1	0	3
2	TIU-UMA-T302	Operations Research & Optimization Techniques	3	0	0	3
3	TIU-UCS-T304	Computer Networks	3	0	0	3
4	TIU-UCS-T306	Web Technology	3	0	0	3
5	TIU-UCS-T316	Computer Architecture	3	0	0	3
6	TIU-UCS-T314	Software Engineering	3	0	0	3
PRACTICAL						
1	TIU-UCS-L304	Computer Networks and System Administration Lab	0	0	3	2
2	TIU-UCS-L306	Web Technology Lab	0	0	3	2
3	TIU-UCS-L316	Computer Architecture Lab	0	0	3	2
SESSIONAL						
1	TIU-UES-S398	Entrepreneurship Skill Development	0	0	3	2
TOTAL CREDIT						26

S. No	ELECTIVE – I					
1	TIU-UCS-E302	Distributed Database Management Systems	3	1	0	3
2	TIU-UCS-E	Digital Signal Processing	3	1	0	3
3	TIU-UCS-E	Information and Coding Theory	3	1	0	3
4	TIU-UCS-E	Advanced Theory of Computation	3	1	0	3

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

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Syllabus

Career Advancement & Skill Development
TIU-UTR-T300

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

OPERATION RESEARCH AND OPTIMIZATION TECHNIQUES
TIU-UMA-T302

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

Introduction: OR modeling approach and various real life situations

Linear programming problems and applications: Various components of LP problem formulation, Solving Linear Programming problem using simultaneous equations and Graphical Method, Simplex Method and extensions

Sensitivity analysis: Duality theory, Revised Simplex Transportation and assignment problems, Network Analysis-shortest Paths, Maximal Flow including PERT-CPM. Integer programming concepts, formulation, solution and applications.

Dynamic Programming: Modeling, Optimization, Replacement.

Game Theory: Introduction, Decisions under risk, Decisions under uncertainty

Queuing Theory: Introduction, basic definitions & notations, axiomatic derivation of the arrival & departure distributions for Poission Queue, Poission Queuing model, M/M/I queues in series, application.

Recommended Books:

Main Reading:

1. Hamdy A. Taha, "Operations Research", Fifth edn. , Macmillan Publishing Company, 1992.
2. Hadley G., "Linear Programming", Narosa Publishers, 1987.
3. Hillier & Lieberman, Introduction to Operations Research, 7/e (with CD),TMH

Supplementary Reading:

1. Hiller F. and Leibermann G. J., "Operation Research", Holder Day Inc, 1974.
2. Schaum outline series, Operations Research,Mc-GrawHill

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SOFTWARE ENGINEERING
TIU-UCS-T314

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

Module 1: Introduction to software engineering: Software and software engineering, phases in software development, software development process models, role of management in software development, role of metrics and measurement.

Module 2: Software requirement specifications: Role of SRS, problem analysis, requirement specification, validation, metrics, monitoring and control.

Module 3: Planning a software project: Cost estimation, project scheduling, staffing, personal planning, team structures, SCM, quality assurance plans, project-monitoring plans, risk management.

Module 4: System design: Design objectives, design principles, module level concepts, design methodology, structured design, design specifications, verification metrics, monitoring and control.

Module 5: Detailed design: Module specification, detailed design and process design language, verification

Module 6: Coding: Programming practice, verification, and metrics.

Module 7: Testing: Testing fundamentals, functional testing, structural testing, testing process, comparison of different V & V techniques.

Recommended Books:

Main Reading:

1. Pankaj Jalote, An Integrated Approach to Software Engineering, BPB Publications.

Supplementary Reading:

1. Roger S Pressman, Software Engineering-A Practitioners Approach, McGraw Hill Publications.

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COMPUTER NETWORKS

TIU-UCS-T304

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

Module I

Overview of data communication and Networking: Introduction; Data communications: components, data representation (ASCII, ISO etc.),direction of data flow (simplex, half duplex, full duplex); Networks: distributed processing, network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN);Internet: brief history, internet today; Protocols and standards.

Reference models: OSI reference model, TCP/IP reference model, their comparative study.

Physical level: Overview of data (analog and digital), signal (analog and digital), transmission (analog & digital) and transmission media (guided & non-guided); TDM, FDM, WDM; Circuit switching: time division and space division switch, TDM bus; Telephone network.

Module II

Data link layer: Types of errors, framing (character and bit stuffing), error detection & correction methods, Flow control.

Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC; Medium access sub layer: Point to point protocol, LCP, NCP, FDDI, token bus, token ring; Reservation, polling, concentration; Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA; Traditional Ethernet, fast Ethernet.

Module III

Network layer: Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, and Gateway;

Addressing: Internet address, classful address, subnetting.

Routing: techniques, static vs. dynamic routing , routing table for classful address.

Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing.

Protocols: ARP, RARP, IP, ICMP, IPV6; Unicast and multicast routing protocols.

Transport layer: Process to process delivery; UDP; TCP; Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm, choke packets; Quality of service: techniques to improve QoS.

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Module IV

Application layer: DNS; SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography, user authentication, security protocols in internet, Firewalls.

Modern topics: ISDN services & ATM; DSL technology, Cable modem, Sonet.

Wireless LAN: IEEE 802.11; Introduction to blue-tooth, VLAN's, Cellular telephony & Satellite network.

Recommended Books:

Main Reading:

1. B. A. Forouzan, Data Communications and Networking, TMH
2. A. S. Tanenbaum, Computer Networks, Pearson Education/PHI
3. W. Stallings, Data and Computer Communications, PHI/ Pearson Education
4. Bhushan Trivedi, Computer Networks, Oxford University Press.

Supplementary Reading:

1. Black, Data & Computer Communication, PHI
2. Miller, Data Communication & Network, Vikas
3. Miller, Digital & Data Communication, Jaico
4. Shay, Understanding Data Communication & Network, Vikas
5. Kurose and Rose, Computer Networking -A top down approach featuring the internet, PearsonEducation
6. Leon, Garica, Widjaja, Communication Networks, TMH
7. Walrand, Communication Networks, TMH
8. Comer, Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.), Pearson Education/PHI

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WEB TECHNOLOGY

TIU-UCS-T306

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

Windows Concepts And Terminology: Key elements, Creating the look, communication via messages, windows resources and functions, adding multimedia and sound Resources Writing windows applications, taking control of windows, adding menus, dialog boxes, Special controls. Concepts of X-Windows System & programming.

Dynamic Web Pages: The need of dynamic web pages; an overview of DHTML, cascading style sheet (css), comparative studies of different technologies of dynamic page creation.

Active Web Pages: Need of active web pages; java applet life cycle. Java Script, Data types, variables, operators, conditional statements, array object, date object, string object. Java Servlet, Servlet environment and role, HTML support, Servlet API, The servlet life cycle, Cookies and Sessions.

JSP: JSP architecture, JSP servers, JSP tags, understanding the layout in JSP, Declaring variables, methods in JSP, inserting, java expression in JSP, processing request from user and generating dynamic response for the user, inserting applets and java beans into JSP, using include and forward action, comparing JSP and CGI program, comparing JSP and ASP program; Creating ODBC data source name, introduction to JDBC, prepared statement and callable statement.

J2EE: An overview of J2EE web services, basics of Enterprise Java Beans, EJB vs. Java Beans, basics of RMI, JNI.

Recommended Books:

Main Reading:

1. Godbole A. S. & Kahate A., Web Technologies, TMH.
2. Xavier C., Web Technology & Design, New Age Publication.

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Supplementary Reading:

1. Java Server Programming, J2EE edition. (VOL I and VOL II), WROX publishers
2. R. W. Scheifler & J. Gettys, X-Window System, PHI.

Computer Architecture

TIU-UCS-T316

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

Overview of von Neumann architecture: Instruction set architecture; The Arithmetic and Logic Unit, The Control Unit, Memory and I/O devices and their interfacing to the CPU; Measuring and reporting performance; CISC and RISC processors.

Pipelining: Basic concepts of pipelining, data hazards, control hazards, and structural hazards; Techniques for overcoming or reducing the effects of various hazards.

Hierarchical Memory Technology: Inclusion, Coherence and locality properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, mapping and management techniques, memory replacement policies.

Instruction-level parallelism: Concepts of instruction-level parallelism (ILP), Techniques for increasing

ILP; Superscalar, super-pipelined and VLIW processor architectures; Vector and Array processors;

Multiprocessor Architecture: Taxonomy of parallel architectures; Centralized shared-memory architecture, synchronization, memory consistency, interconnection networks; Distributed shared-memory architecture, Cluster computers.

Non von Neumann Architectures: Data flow Computers, Reduction computer architectures, Systolic Architectures.

Recommended Books:

Main Reading:

1. John L. Hennessy and David A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann.

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2. Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability, Programmability, McGraw-Hill.

Supplementary Reading:

1. John Paul Shen and Mikko H. Lipasti, Modern Processor Design: Fundamentals of Superscalar Processors, Tata McGraw-Hill.

M. J. Flynn, Computer Architecture: Pipelined and Parallel Processor Design, Narosa Publishing House.

DIGITAL SIGNAL PROCESSING
TIUCSE-606A

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

Signals and systems : Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; Classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect, Digital signal representation.

Characterization and properties of discrete time signals and systems : Discrete-Time sequences and systems, Properties of linear time-invariant systems, Linear convolution, Eigenfunctions for linear time-invariant systems, Linear constant-coefficient difference equations.

Discrete time system analysis : z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Fourier transform of discrete sequence – Discrete Fourier series.

Discrete Fourier transform & computation: DFT properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT & DIF - FFT using radix 2 – Butterfly structure.

Implementation of structures for discrete time systems: Block diagram and signal flow graph representation of linear constant-coefficient difference equations, Basic structures for IIR and FIR systems, Transposed forms.

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Design of digital filters: FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping - Frequency transformation.

Digital signal processors: Introduction – Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial Processors.

Recommended Books:

Main Reading:

1. Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, Discrete-Time Signal Processing, Pearson Education India
2. J. G. Proakis and D. G. Manolakis, Digital Signal Processing Principles, Algorithms and Applications, Pearson Education, PHI

Supplementary Reading:

1. S. K. Mitra, A Computer Based Approach, Digital Signal Processing ,Tata McGraw Hill
2. Ramesh Babu, Digital Signal Processing, Scitech

INFORMATION AND CODING THEORY
TIUCSE-606B

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

Communication processes. Channel matrix. Probability relation in a channel. The measure of information. Entropy function: Properties of entropy function. Channel capacity. Special types of channels. Binary symmetric channel. Encoding. Block code. Binary code. Binary Huffman code.Shannon – Fano Encoding procedure. Noiseless coding theorem. Shannon's first theorem, DS model, Bell function.

Error – Correcting codes, Examples of codes, Hadamard matrices and codes. Binary Colay code. Matrix description of linear codes. Equivalence of linear codes. The Hamming codes. The standard array. Syndrome decoding.

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Recommended Books:

Main Reading:

1. G. A. Jones et. al, Information and Coding Theory, Springer – Verlag.
2. Ranjan Bose, Information Theory, Coding and Cryptography, McGraw Hill Education

Supplementary Reading:

1. J. H. van Lint. Introduction to Coding Theory, Springer -Verlag.
2. Ketha Anuradha Rao, Information Theory and Coding, Nandu Printers & Publishers Pvt. Ltd

ADVANCED THEORY OF COMPUTATION
TIUCSE - 606C

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

Brief Review: Regular Languages, DFA. Nondetermism, NFA Minimization, Myhill-Nerode theorem.

Computability: Turing Machines, Enumeration of Turing Machines, Undecidability. Rice-Myhill-Shapiro theorem. Resource bounded computation. Notion of a computational resource. Tape reduction, Speedup theorems.

Time Complexity: Crossing Sequences and their applications. Hierarchy theorems. P vs NP. Time Complexity classes and their relationships. Notion of completeness, reductions. Cook-Levin Theorem.

Space Complexity: Space as a resource. Savitch's theorem, Inductive Counting. PSPACE, L and NL, Logic Programming.

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Recommended Books:

Main Reading:

1. John E. Hopcroft, Rajeev Motwani And Jeffrey D. Ullman, Introduction To Automata Theory, Languages, And Computation, Pearson Education Asia.
2. K.L.P. Mishra And N. Chandrasekaran, Theory Of Computer Science, Phi Publication.

Supplimentary Reading:

1. Dexter C. Kozen, Automata And Computability, Undergraduate Texts In Computer Science, Springer.
2. Michael Sipser, Introduction To The Theory Of Computation, Pws Publishing.
3. John Martin, Introduction To Languages And The Theory Of Computation, Tata Mcgraw Hill.
4. Harry R. Lewis And Christos H. Papadimitriou, Elements Of The Theory Of Computation, Pearson Education Asia.

DISTRIBUTED DATABASE MANAGEMENT SYSTEMS

TIU-UCS-E302

L-T-P: 3-1-0 **Credits: 3**

Relational Databases: Integrity Constraints revisited: Functional, Multi-valued and Join Dependency, Template, Algebraic, Inclusion and Generalized Functional Dependency, Chase Algorithms and Synthesis of Relational Schemes.

Query Processing and Optimization: Evaluation of Relational Operations, Transformation of Relational Expressions, Indexing and Query Optimization, Limitations of Relational Data Model, Null Values and Partial Information.

Deductive Databases: Datalog and Recursion, Evaluation of Data log program, Recursive queries with negation.

Objected Oriented and Object Relational Databases: Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases.

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Case Studies: SQL, Oracle, DB2.

Parallel and Distributed Databases:

Distributed Data Storage: Fragmentation and Replication, Location and Fragment Transparency, Distributed Query Processing and Optimization, Distributed Transaction Modeling and Concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, Parallel Query Evaluation.

Advanced Transaction Processing: Nested and Multilevel Transactions, Long Duration Transactions, Weak Levels of Consistency, Transaction Work Flows.

Active Databases: Triggers in SQL

Event Constraint and Action: ECA Rules, Query Processing and Concurrency Control, Compensation and Databases Recovery.

Real Time Databases: Temporal Constraints: Soft and Hard Constraints, Transaction Scheduling and Concurrency Control.

Image and Multimedia Databases: Modeling and Storage of Image and Multimedia Data

WEB Databases: Accessing Databases through WEB, WEB Servers, XML Databases

Commercial Systems: Oracle, DB2.

Data Mining: Knowledge Representation Using Rules, Association and Classification Rules, Sequential Patterns, Algorithms for Rule Accessing.

Recommended Books:

Main Reading:

1. Abraham Silberschatz, Henry Korth, and S. Sudarshan, Database System Concepts, McGraw-Hill.
2. Raghu Ramakrishnan, Database Management Systems, WCB/McGraw-Hill.
3. Bipin Desai, An Introduction to Database Systems, Galgotia.

Supplementary Reading:

1. J. D. Ullman, Principles of Database Systems, Galgotia.
2. R. Elmasri and S. Navathe, Fundamentals of Database Systems8, Addison-Wesley.
3. Serge Abiteboul, Richard Hull and Victor Vianu, Foundations of Databases. Addison-Wesley.

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OPERATION RESEARCH AND OPTIMIZATION TECHNIQUES LAB
TIUMTH – 692

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

Software based lab using C or any O.R. package.

(1) Linear Programming (Transportation, Assignment , Duality , Simplex)
(2) Shortest Path (Dijkstra's , Floyd's Algorithm)
(3) Maximal Flow.
(4) PERT/CPM
(5) Queueing Theory
(6) Integer Programming Problem (Branch & Bound Problem)

N:B:-Familiarization with C or any O.R. package.

COMPUTER NETWORKS AND SYSTEM ADMINISTRATION LAB
TIU-UCS-L304

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

Module I: Computer Networks

1. IPC (Message queue)
2. NIC Installation & Configuration (Windows/Linux)
3. Familiarization with Networking cables (CAT5, UTP)
4. Connectors (RJ45, T-connector) Hubs, Switches
5. TCP/UDP Socket Programming
6. Multicast & Broadcast Sockets
7. Implementation of a Prototype Multithreaded Server
8. Implementation of Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)
9. Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)
10. Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)

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Module II: System Administration

1. Packet Monitoring software (tcpdump, snort, ethereal)
2. Trace route, Ping, Finger, Nmap
3. Server configuration (FTP, SMTP, DNS)
4. NFS Configuration
5. Firewall Configuration using iptables/ipchains (Linux only)
6. Experiments using Turbo C Assembler

Note: All the above experiments may be performed in both Unix /Linux & Windows

WEB TECHNOLOGY LAB

TIU-UCS-L306

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

Assignments given by the concerned faculty are to be solved.

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