Course Syllabi
Department of Computer Science and Engineering

CSL101 COMPUTER PROGRAMMING
(3-0-2-4)
Pre-requisite: NIL
Contents:
Overview of a computer system, Block diagram and major parts of a computer, history of computer development, introduction to binary, octal, & hexadecimal numbers, ASCII code, different levels of programming languages – machine language, assembly language, high level language; need of operating system, tree structure of storage, introduction to assembler, compiler and interpreter.

Introduction: Flow charts, data types and storage classes, scope of variables, arithmetic operators, assignment, conditional, arithmetic expressions, enumerated data types, decision making, branching, looping, Switch concept, function and parameter passing, recursive functions, macros, Basic programming algorithms: Programs to illustrate basic language constructs in C like - Factorial, Sine/cosine and other mathematical series, Fibonacci series, calculating square-root of a number, calculating GCD of 2 integers (Euclid’s method and otherwise), Calculating LCM of 2 integers and similar such programs.

Arrays and applications: Introduction to one dimensional and 2-D array with examples. Representing a polynomial using 1-D array and polynomial operations, Use of 2-D array to represent a matrix and matrix operations. Character arrays (strings): String related functions (strlen, strcpy, strcat, strcmp, reverse etc.) and their function definitions. Searching and Sorting methods: Selection sort, Bubble sort, Insertion sort, Linear and binary search, partitioning an array, merging of 2 sorted arrays. Introduction to “Divide and Conquer” via Mergesort and Quicksort.

Structures and Unions: Basic concept, array of structures and its applications.

Pointers: Introduction (declaration and initialization), pointers and arrays, concept of dynamic memory allocation, use of pointers to represent variable-sized 1-D and 2-D arrays, pointers to structures.

File Management in C: Open, close, read and write operations, Sequential and text files.

Practical: Practicals as per course contents.

Text Books:

Additional Books:

CSL202 DATA STRUCTURES AND PROGRAM DESIGN
(3-0-2-4)
Pre-requisite: NIL
Contents:
Types and operations, Iterative constructs and loop invariants, Structured programming and modular design, Illustrative examples, recursion, program stack and function invocations including recursion. Overview of arrays and array based algorithms - searching and sorting, Overview of Selection sort, bubble sort and insertion-sort, Divide and Conquer – Merge sort, Quicksort, Binary search, Introduction to Program complexity (Big Oh notation), Recurrence relations.


Practical: Practicals as per course contents.

Text Books:

Additional Books:

CSL203 CONCEPTS IN PROGRAMMING LANGUAGES
(3-0-2-4)
Pre-requisite: NIL
Contents:
Addressing methods, their application in implementation of HLL constructs and data structures, instruction formats, expanding op-code method, subroutine linkage. Instruction sets of ARM, Intel and Motorola Processors. Processing unit, bus architecture, execution of a complete instruction, sequencing of control signals, micro programmed control, microinstruction format, microinstruction sequencing, bit slice concept. Arithmetic, number representations and their operations, design of fast address, signed multiplication, Booth’s Algorithm, bit-pair recording, division , floating point numbers and operations, guard bits and rounding.

Main memory organization, various technologies used in memory design, higher order memory design, multi module memories and interleaving, cache memory, concept of cache memory, mapping functions, replacement algorithms. Input-output organization, I/O mapped I/O and memory mapped I/O, Direct Memory Access, interrupt and interrupts handling mechanisms, interrupt identification, vectored interrupts, interrupt nesting, I/O interfaces, synchronous vs. asynchronous data transfer, I/O channels. Computer peripherals, I/O devices such as video terminals, video displays, graphic input devices, printers, magnetic disk, magnetic tape, CDROM systems.

Introduction to RISC philosophy, Pipelining, Basic concepts in pipelining.

Text Book:

Additional Books:

CSL204 HARDWARE/SOFTWARE INTERFACE
(3-0-2-4)
Pre-requisite: NIL
Contents:

Data type, elementary data type, structured data type, elements of specification and implementation of data type. Implementation of elementary data types : integer, real, character, Boolean and pointer. Implementation of structured data types. Vectors & arrays, records and files. Type checking, type conversion and initialization.

Evolution of data type concept. Abstract data type, encapsulation. Design and implementation of new data types through subprograms. Subprogram definition and activation, their implementation, parameter passing, generic subprograms. Sequence control structures used in expressions and their implementation. Sequence control structures used between statements or group of statements and their implementation. Sequence control structures used between subprograms, recursive and non-recursive subprogram calls. Data control, referring environment dynamic and static scope, static chain implementation and display implementation.
Type definition as mechanism to create new abstract data types, type equivalence, type definitions with parameters. Defining new abstracts data types Storage management issues, like static and dynamic allocation, stack based allocation and management, Heap based allocation and management. Garbage collection.Introduction to exception handling.

Practical: Practicals as per course contents.

Text Book:

Additional Book:

CSL204 INTRODUCTION TO OBJECT ORIENTED METHODOLOGY (3-0-2-4)
Pre-requisite: NIL

Contents:
Object Oriented Programming. Features of object oriented programming languages like data encapsulation, inheritance, polymorphism and late binding. Concept of a class, Access control of members of a class, instantiating a class, static and non-static members, overloaded a method. Deriving a class from another class, access control of members under derivation, different ways of class derivation, overriding of a method, run time polymorphism. Concept of an abstract class. Concept of an interface. Implementation of an interface. Exception and exception handling mechanisms. Study of exception handling mechanisms in object-oriented languages.

Introduction to streams, use of stream classes. Serialization and de-serialization of objects. Templates, Implementation of data structures like linked lists, stacks, queues, trees, graphs, hash table etc. using object oriented programming languages.

Introduction to concept of refactoring, modeling techniques like UML, Design patterns.

Practical: Practicals as per course contents.

Text Books:

Additional Books:

CSL301 THEORY OF COMPUTATION (3-2-0-4)
Pre-requisite: CSL 201 DATA STRUCTURES AND PROGRAM DESIGN SCL401DISCRETE MATHEMATICS

Contents:
Preliminaries - Sets, operations, relations, transitive closure, countability and diagonalisation, induction and proof methods - pigeon-hole principle and simple applications- concept of language- grammars and production rules- Chomsky hierarchy. Regular grammars, deterministic finite automata - non determinism, conversion to deterministic automata-e-closures, regular expressions, finite automata, regular sets. Pump lemma for regular sets - closure properties of regular sets, decision properties for regular sets, minimization of automata. Context - free languages, parse trees and ambiguity, reduction of CFGS, Chomsky and Greibach normal forms, push - down Automata (PDA), non-determinism, acceptance by two methods and their equivalence, CFLs and PDAs - Pumping lemma for context free languages, Closure and decision properties of CFLs.

Turing machines- variants, recursively enumerable (r. e) sets, recursive sets, TM as computer of function, decidability and solvability, Halting Problem reductions, Post correspondence Problem (PCP) and insolubility of ambiguity problem of CFGs.


Text Book:

Additional Book:

CSL302 OPERATING SYSTEMS (3-0-2-4)
Pre-requisites: CSL 201 DATA STRUCTURES AND PROGRAM DESIGN CSL 202 COMPUTER ORGANIZATION

Contents: Introduction, basic h/w support necessary for modern operating systems - Services provided by OS, system programs and system calls – brief discussions of evolution of OS- real time and distributed systems: a brief overview of issues. File systems, user interface - disk space management and space allocation strategies- examples from UNIX, DOS, Windows etc– directory structures- disk caching- file system consistency and logs- disk arm scheduling strategies. Processes and 3 levels of scheduling - process control block and context switch - goals of scheduling and different scheduling algorithms- threads: user-level and kernel level, Memory management techniques - contiguous and non-contiguous paging and segmentation - translation look-aside buffers (TLB) and overheads - virtual memory and demand paging - page faults and instruction restart - problems of large address spaces - page replacement algorithms and working sets - miscellaneous issues. Process cooperation and synchronization - mutual exclusion and implementation - semaphores, conditional critical regions and monitors - classical inter - process communication problems- message passing. Deadlocks and strategies for handling them. Protection and security issues - access lists, capabilities, cryptographic techniques - introduction to distributed systems.

Practical: Practicals as per course contents.

Text Books:

Additional Books:

CSL303 COMPUTER NETWORKS (3-0-2-4)
Pre-requisite: CSL308 ANALYSIS OF ALGORITHMS

Contents:

CN Lab: Practical based on 1. Using TCP sockets or Network socket programming
2. Client-server application for chat
3. PC to PC file transfer using serial port
4. Implementation of Shortest path routing
5. Implementation of Sliding Window Protocol
6. Implementation of Address Resolution Protocol
7. Implementation of Open Shortest Path First Protocol
8. Using n/w simulators like: NS2, DCL/DLL simulator
10. Implementation of TCP/IP Echo.
11. Using simple UDP.

Text Books:

Additional Books:

CSL304 SYSTEM PROGRAMMING (3-0-2-4)
Pre-requisites: CSL 201 DATA STRUCTURES AND PROGRAM DESIGN, CSL 202 COMPUTER ORGANIZATION

Contents:
Assembler, Macro processor - Concept of assembler, design of single pass and two pass assembler, forward reference, design of output file of assembler, concept of macro, macro call within macro, macro definition within macro, recursive macro calls, design of macro processor.
Linker and Loader - Concept of static and dynamic relocation, external symbols, design of linker, design of object file for different loading schemes.
Common Object file format - Structure object file and executable file, section or segment headers, symbol table, concept of storage class, string various, data types line insert, character, arrays structures.
System utilities - Source code control system, make, link editor, symbolic debugger, pattern matching language like awk.
Device Drivers - Device programming, system drivers, non-system drivers, virtual drivers, Incorporation of driver routines, Basic device driver operation, character and block drivers.
Practical: Practicals as per course contents.

Text Books:

Additional Books:
6. UNIX System Utilities Manual

CSL305 DATABASE MANAGEMENT SYSTEMS (3-0-2-4)
Pre-requisite: CSL302 OPERATING SYSTEMS

Contents:
Database system concepts and Architecture - concept of relational database, Relational data model, Relational algebra, SQL-the relational database standard, ER and EER model.
Database design theory - Functional dependencies and normalization, relational database design algorithms, practical database design and demoralization, Relational constants, programmatic ways for implementing constraints, triggers, Chase algorithm.
Physical database design - Concept of physical and logical hierarchy, storage structures like cluster, index organized table, partitions, various table storage Parameters and block storage parameters, concept of index, B-trees, hash index, Function index, bitmap index.
Process and memory management in database- Various types of tasks in database, database buffer management, log buffer management code reuse, concept of two tier and N-tier architecture, data dictionary and catalog information database recovery technique. Ariet Algorithm for recovery.
Query optimization and performance tuning- Various techniques for query optimization, strong and weak equivalence, cost base optimization, Use of different storage structures in query optimization.
Transaction Processing - Transaction and system concepts, Desirable properties of transaction, Schedules and recoverability, serializability of schedules, concurrency control, lock base protocols and time stamp based protocols, read consistency.
Practical: Practicals as per course contents.

Text Book:

Additional Books:

CSL306 LANGUAGE PROCESSORS (3-0-2-4)
Pre-requisite: CSL301 THEORY OF COMPUTATION

Contents:
Introduction to compilers,compilers and translators, phase structure of a typical compiler, Number of passes, ideas about lexical analysis, syntax analysis, code optimization and code generation, design of lexical analyzer.
Syntax specification of programming languages, Design of top-down parser, bottom up parsing technique, LR parsing algorithm, Design of SLR, LALR,LR parsers. Dealing with ambiguity of the grammar.
Study of syntax directed definitions and syntax directed translation schemes as notational frame work to specify the translations. Using syntax directed translation schemes for translation of expressions, controls structures, declarations, procedure calls.
Storage allocation and run time storage administration, symbol table management, Error detection and recovery, error recovery in LR parsing, error recovery in LL parsing. Automatic error recovery in YACC.
Introduction to Important code optimization techniques, loop optimization, control flow analysis, data flow analysis, setting up data flow equations to compute reaching definitions, available expressions, Live variables, Problems in code generation, simple code generator code generation from DAG, Peephole optimization.
Practical: Practicals as per course contents.

Text Book:

Additional Books:

CSL307 SOFTWARE ENGINEERING (3-0-2-4)
Pre-requisite: CSL204 INTRODUCTION TO OO METHODOLOGIES

Contents:
Software Engineering Process & Management: Generic view, Capability Maturity Model, Process models- waterfall, evolutionary, incremental etc., unified process, agile view, project management, metrics estimation, project scheduling, risk management.
Software engineering Principles and Practice: Communication, planning and modeling practices, system engineering and modeling, business process engineering requirement analysis, system analysis- flow oriented and class oriented modeling using data modeling concepts.
Software Design Engineering: Design Concepts: Abstraction Architecture, pattern modularity, information hiding, design classes, refactoring etc., Design of web application, architectural design, component level design, user interface design.
Software Testing and Quality Management: Testing strategies, testing for object oriented software testing for web applications, validation testing etc. Black box testing, white box testing, Basis path testing. Testing for specialized environments, architectures and application. Quality concepts, quality assurance, software reviews, statistical quality assurance.
Software configuration management and advance topics : Elements of configuration management system, process configuration for web engineering, component-based development, clean room software engineering, formal methods, software reengineering, Software Maintenance.
Practical: Practicals as per course contents.

Text Books:

Additional Books:

CSL308 ANALYSIS OF ALGORITHMS (3-2-0-4)
Pre-requisite: CSL 201 DATA STRUCTURES AND PROGRAM DESIGN

Contents:
Mathematical foundations, summation of arithmetic and geometric series, \( n, n^2, n^3 \), Bounding summations using integration, recurrence relations, solutions of recurrence relations using technique of characteristic equation and generating functions.

Asymptotic notations of analysis of algorithms, analyzing control structures, worst case and average case analysis, amortized analysis, sorting algorithms such as quick sort, insertion sort, bubble sort, heap sort, lower bound of proof, elementary and advanced data structures with operations on them and their time complexity.

Divide and conquer basic strategy, binary search, quick sort, merge sort, Fast Fourier Transform etc. Greedy method - basic strategy, application to job scheduling with deadlines problem, minimum cost spanning trees, single source shortest path etc.

Dynamic Programming basic strategy, multistage graphs, all pairs shortest path, single source shortest paths, optimal binary search trees, traveling salesman problem.

Basic Traversal and Search Techniques, breadth first search and depth first search, connected components. Backtracking basic strategy, 8-Queen’s problem, graph coloring, Hamiltonian cycles etc. NP-hard and NP-complete problems, basic concepts, nondeterministic algorithms, NP-hard and NP-complete, Cook’s Theorem, decision and optimization problems, polynomial reduction.

Text Books:

Additional Books:

CSL309 NEURO-FUZZY TECHNIQUES (3-0-2-4)

Pre-requisite: NIL

Contents:


Genetic Algorithm: An Overview of GA, GA operators, GA in problem solving, Implementation of GA.

Practical: Practicals as per course contents.

Text Books:

Additional Books:


CSL310 COMPUTER GRAPHICS (3-0-2-4)

Pre-requisite: CSL 201 DATA STRUCTURES AND PROGRAM DESIGN

Contents:
Basic fundamentals of random scan, raster-scan devices, LCD displays - point and line drawing techniques and algorithms - input/output devices and interactive techniques.

Polygon filling methods: Seed fill, edge flag algorithm etc. - scan conversion techniques - anti aliasing techniques - clipping algorithms, Polygon clipping, Viewpoint transformation, Windowing transformation.

Linear transformation: rotation, scaling, translation in 3D - homogeneous coordinates - normalized device coordinates - windowing and view porting, Cartesian Coordinates, Word view etc.


Graphics software packages - segmentation and display files - graphics standards - graphics and computer networks - basic principles of X windows, X terminals, Functions for segmenting display files.

Practical: Practicals as per course contents.

Text Book:

Additional Books:

CSL311 INTERNET TECHNOLOGIES (3-0-2-4)

Pre-requisite: NIL

Contents:
Evolution of Internet, TCP/IP: addressing and routing. Internet applications: FTP, Telnet, Email, Chat, Internet Wide Web; HTTP protocol. Designing web pages, HTML forms, CGI scripts and clickable maps, JAVA applets, JavaScript, JAVA servlets, Perl, DHTML, XML.

E-Commerce and security issues including symmetric and asymmetric key, encryption and digital signature, authentication. Emerging trends, Internet telephony, virtual reality over the web, etc. Intranet and Extranet, firewall design issues.

Practical: Practicals as per course contents.

Text Book:

Additional Books:

CSL312 TOPICS IN GRAPH THEORY (3-0-2-4)

Pre-requisite: SCL401 DISCRETE MATHEMATICS, CSL308 ANALYSIS OF ALGORITHMS

Contents:


Text Book:

Additional Books:
CSL401 REAL-TIME SYSTEMS (3-0-2-4)
Pre-requisites: CSL302 OPERATING SYSTEMS

Contents:
Real-time applications: Hard and soft real-time systems, timing constraints, A
model of real-time systems, temporal parameters, precedence
constraints & dependencies, scheduling hierarchy, Commonly used approaches
to scheduling, cyclic and priority-driven approaches, Optimality of EDF and
LST. Clock Driven Scheduling. Priority-driven scheduling, time
executives, Improving Average Response times of Aperiodic Jobs, Scheduling Sporadic jobs,
Practical Considerations, Pros and Cons of Clock Driven Scheduling Priority-
driven scheduling of periodic tasks: Fixed Priority vs Dynamic Priority schemes,
Maximum schedulable Utilization, Optimality of the RM and DM algorithms, As
Schedulable Task for Fixed Priority Tasks, Practical Factors.
Scheduling Aperiodic and Sporadic Jobs in Priority-driven scheduling: Deferable
Servers, Sporadic Servers, Constant Utilization. Total Bandwidth, and Weighted
Fair-Queuing Servers, Scheduling of Sporadic Jobs. Resources and resource access control: non-preemptive critical
sections, basic priority-inheritance, ceiling protocol, multiprocessor scheduling,
predictability and validation of dynamic multiprocessor systems flexible applications, tasks with temporal distance constraints.
Real-time Operating systems: Overview, Time Scheduling and Scheduling
Mechanisms, Basic Operating System Functions, Processor Reserves and Resource
Kernel, Open System Architecture, Capabilities of Commercial RTOS.
Practical: Practicals as per course contents.

Text Book:

Additional Book:
2010.

CSL402 ARTIFICIAL INTELLIGENCE
(3-0-2-4)
Pre-requisites: CSL308 ANALYSIS OF ALGORITHMS

Contents:
Introduction: What is AI?, History, Overview, Intelligent Agents, Performance
Measure, Rationality, Structure of Agents, Problem-solving agents, Problem
Formulation, Uninformed Search Strategies
Informed (Heuristic) Search and Exploration, Greedy best first search, A* search,
Memory bounded heuristic search, Heuristic functions, inventing admissible
heuristic functions, Local Search algorithms, Hill-climbing, Simulated
Annealing, Genetic Algorithms, Online search
Constraint Satisfaction Problems, Backtracking Search, variable and value
ordering, constraint propagation, intelligent backtracking, local search for CSPs,
Adversarial Search, Games, The minimax algorithm, Alpha-Beta pruning,
Imperfect Real-Time Decisions, Games that include an Element of Chance
Knowledge Based Agents, Logic, Propositional Logic, Inference, Equivalence,
Validity and Satisfiability, Resolution, Forward and Backward Chaining, DPLL
algorithm, Local search algorithms, First Order Logic, Models for first order
logic, Symbols and Interpretations, Terms, Atomic sentences, complex sentences,
Quantifiers, Inference in FOL, Unification and Lifting, Forward Chaining,
Backward Chaining, Resolution
Planning, Language of planning problems, planning with state-space search,
forward and backward state-space search, Heuristics for state-space search,
partial order planning, planning graphs, planning with propositional logic.
Uncertainty, Handling uncertain knowledge, rational decisions, basics of
probability, axioms of probability, inference using full joint distributions,
independence, Bayes’ Rule and conditional independence, Bayesian networks,
Semantics of Bayesian networks, Exact and Approximate inference in Bayesian
Networks.
Practical: Practicals as per course contents.

Text Book:

Additional Books:
2. Patterson, D.W., Introduction to Artificial Intelligence and Expert Systems,

CSL403 FUNDAMENTAL ALGORITHMS
IN COMPUTATIONAL BIOLOGY (3-0-2-4)
Pre-requisites: SCL 404 PROBABILITY AND NUMERICAL METHODS, CSL 308 ANALYSIS OF ALGORITHMS

Contents:
DNA and Sequence Alignment – KMP-algorithm, BLAST and FASTA, Sorting
by Reversals, Biological Databases – formats, downloading and using data, Phylogeny – Distance based algorithms (Hamming /Euclidian distance),
Sitemap Trees, Prediction of RNA secondary structure, Gene Prediction using
Bayesian Methods and Markov Chains/HMMs, Modeling-Based on Cellular
Automata, Based on Agent Based Modeling Techniques, Based on Partial
Differential Equations, Single Nucleotide Polymorphism and algorithms for their
identification, Microarray Data and Clustering – Hierarchical/K-Means, Pathway
Data and their analysis, Protein Folding and Docking based on Entropy
calculations.
Practical: Practicals as per course contents.

Text Books:
1. Eilmer, S. P. and Guckenheimer, J., Dynamic Models in Biology, New
    2002.

Additional Books:
1. Mandou, Land Zelikovsky, A., Bioinformatics Algorithms: Techniques and
    Applications, Wiley Series on Bioinformatics: Computational Techniques
2. Course Website of Ron Shamir, Tel Aviv University
(http://www.cs.tau.ac.il/~rshamir/alglib/alglib-archive.htm).

CSL404 NETWORK SECURITY (3-0-2-4)
Pre-requisites: CSL 303 COMPUTER NETWORKS, CSL 302 OPERATING SYSTEMS, SCL401 DISCRETE MATHEMATICS

Contents:
Classical Ciphers: Affine, Playfair, Hill Cipher, Modern Block and Stream
Ciphers: DES, AES, RC4, ASL, Block Modes of Operation: ECB, CBC, CFB, OFB, CTR
Asymmetric Key Cryptosystems: RSA, Digital Signatures: DSS, Hash and
MAC: SHA-512 Key Management: Digital Certificates, PKI, Authentication:
One-Way Authentication, Mutual Authentication, Dictionary Attacks,
Centralized Authentication, The Needham-Schroeder Protocol, Kerberos,
Non-cryptographic Protocol Vulnerabilities: DoS and DDoS, Session Highjacking and
Spoofing, ARP Spoofing and Attacks on DNS, Software Vulnerabilities:
Phishing, Buffer overflow, cross site scripting and SQL injection Viruses,
Worms, and other Malware: Virus and Worm Features, Internet Scanning
Worms, Mobile Malware and Botnets, Access Control in Operating Systems:
Discretionary Access Control, Mandatory Access Control, Role Based Access
Control, SELinux and Recent Trends RSVP and E-Passports Electronic
payment.
Practical: Practicals as per course contents.

Text Books:
1. Forouzan, B.A. and Muhkopadhyay, Debdeep, Cryptography and Network
2. Stallings, W., Cryptography and Network Security: Principles and Practice,

Additional Books:
    Hall, 2012.

CSL405 DATA MINING AND DATA
WAREHOUSING (3-0-2-4)
Pre-requisites: CSL305 DATABASE MANAGEMENT SYSTEMS

Contents:
Introduction to Datawarehouse, Application of Datawarehousing and mining,
Data warehouse development life cycle, Data warehouse analysis, CUBE, ROLL
UP and STAR queries, Data ware house Architecture, OLAP, MOLAP and MOLAP, Concepts of Fact
and Dimension table.
Space Management in Datawarehouse- Schemes for storing data in warehouse
using different storage structures, B-tree index, hash index, clusters, Bitmap
index functional index, domain index, Data partitions, Performance and Tuning- Query optimization, memory management, process
management/I/O management for Data warehouse.
Data Mining Tools – Association rules, a priori algorithm, FP-trees algorithm,
Constraints and solution.
Cluster analysis- paradigms, DBSCAN, cluster algorithms.
Mining tools- decision trees and applications.
Practical: Practicals as per course contents.

Text Books:
1. Han, J., Kamber, M. and Pei, J., Data Mining: Concepts and Techniques,

CSL406 ADVANCED COMPUTER ARCHITECTURE (3-0-2-4)
Pre-requisites: CSL202 COMPUTER ORGANIZATION

Contents:

Practical: Practicals as per course contents.

Text Book:

Additional Books:

CSL407 DISTRIBUTED SYSTEMS (3-0-2-4)
Pre-requisites: CSL 302 OPERATING SYSTEMS, CSL 303 COMPUTER NETWORKS

Contents:
Motivation and goals, broad overview and advantages of distributed systems, main characteristics absence of global clock and state and possibility of large network delays Issues in distributed systems such as transparency, scalability, security etc. Middleware such as sockets, RPC, RMI etc. Distributed file systems design issues case studies with emphasis on NFS distributed shared memory coherence and coherence protocols design issues and case studies, clock synchronization Theoretical foundations Lamport’s clocks-Chandy-Lamport Global State recording algorithm termination detection, leader election. Distributed mutual exclusion Lamport, Ricart Agrawal non-token based algorithm - token based algorithms comparative performance analysis Distributed deadlock detection issues central and distributed detection algorithm agreement protocols model of processor failures Byzantine agreement and other problems solutions and applications. Distributed scheduling issues load distributing algorithms load sharing policies and case studies task migration and issues Recovery: introduction and basic concepts backward and forward error recovery, Checkpointing: synchronous and asynchronous atomic actions and commit protocols voting protocols reliable communication.

Practical: Practicals as per course contents.

Text Books:

Additional Book:

CSL408 INFORMATION RETRIEVAL (3-0-2-4)
Pre-requisite: NIL

Contents:
Boolean retrieval, the term vocabulary and postings lists, Dictionaries and tolerant retrieval, Introduction to index-construction and index-compression. Scoring, term weighting and the vector space model, Computing scores in a complete search system, Evaluation in information retrieval, Introduction to Relevance feedback and query expansion. Probabilistic information retrieval, review of basic probability theory, the probability ranking principle, the binary independence model Language models for information retrieval, Language modeling versus other approaches to IR, Text classification and Naive Bayes, Bayesian Network approaches to IR, Vector space classification, Support vector machines and machine learning on documents, Flat clustering Hierarchical clustering, Matrix decomposition and latent semantic indexing. Introduction to Web search basics, Web crawling and indexes, Link analysis.

Practical: Practicals as per course contents.

Text Books:

Additional Books:

CSL409 PATTERN RECOGNITION (3-0-2-4)
Pre-requisites: NIL

Contents:

Practical: Practicals as per course contents.

Text Book:

Additional Books:

CSL410 INTRODUCTION TO VIRTUALIZATION AND CLOUD COMPUTING (3-0-2-4)
Pre-requisite: NIL

Contents:
Overview of virtualization cloud computing - Virtualization: Virtualization technologies and architectures, Internals of virtual machine monitors hypervisors, Migration mechanisms. Cloud Services: infrastructure as a service, platform as a service and software as a service, HCI in cloud computing, Types of Cloud public, private and hybrid clouds, cloud in a box. Cloud enabling technologies: Introduction to Hadoop, Map reduce, NoSQL, MongoDB, Encryption techniques, SSL. ’Big data’ concepts, storage and management: clustering, dynamic provisioning and resource management, security, scalability, privacy and other risks. Case Study: Implementation examples of Cloud services.

Practical: Practicals as per course contents.

Text Books:

Additional Book:

CSL411 WIRELESS COMMUNICATION & NETWORKS (3-0-2-4)
Pre-requisite: CSL303 COMPUTER NETWORKS

Contents:

Practical: Practicals as per course contents.

Text Book:

Additional Books:

CSL413 ADVANCED COMPUTER NETWORKS (3-0-0-3)
Pre-requisite: CSL 303 COMPUTER NETWORKS

Contents:
An introduction to the internet, the world wide web (WWW), and the Hypertext Transfer Protocol (HTTP), internet servers, high speed networks, optical networks, cellular networks, fixed infrastructure networks, multicast algorithms, intranet and internet routing protocols, comparison between distance vector and link state routing mechanisms, encryption, and resource reservation. Quality of service. General Congestion Control and Queuing. Asynchronous Transfer Mode (ATM), Border Gateway Protocol (BGP), Hypertext Transfer Protocol (HTTP), IP version 6 (IPv6), 802.11 Wireless Networks (a/b/g/n), UMTS, GSM. TCP Variants, Active Queue Management, Overlay Networks’ like RON, P2P, CDN etc., Emerging applications.

Text Books:

Additional Books:

CSL 412 EMBEDDED SYSTEMS (3-0-2-4)
Pre-requisite: CSL202 COMPUTER ORGANIZATION

Contents:
Introduction to embedded systems: Classification, Characteristics and requirements, Applications. Numbering and coding systems, Digital primer, inside the computer. The 8051 microcontrollers, introduction to 8051 assembly programming, Assembly and running an 8051 programs, the program counter and ROM space in the 8051, 8051 data types and directives, 8051 flag bits and the PSW register, 8051 register banks and stack, Loop and jump instructions, Call instructions, Time delay for various 8051 chips, 8051 I/O programming , I/O manipulation programming, Addressing modes (immediate and register addressing modes, accessing memory using various addressing modes, bit addresses for I/O and RAM, Extra 128-byte on-chip RAM in 8052, Pin description of the 8051, Programming of 8051 timers , Counter programming, Basics of serial communication, 8051 connection to RS232, 9051 serial port programming in assembly, 8051 interrupts, Programming timer interrupts, Programming external hardware interrupts, Programming the serial communication interrupt, interrupt priority in the 8051/S2, LCD interfacing, Keyboard interfacing.

Practical: Practicals as per course contents.

Text Book:

Additional Books:

CSL414 ADVANCED AUTOMATA THEORY (3-0-0-3)
Pre-requisite: CSL301 THEORY OF COMPUTATION

Contents:

Practical: Practicals as per course contents.

Text Book:

Additional Books:

CSL415 STATISTICAL MODELS FOR COMPUTER SCIENCE (3-0-0-3)
Pre-requisites: SCL203 PROBABILITY AND NUMERICAL METHODS

Contents:

Text Book:

Additional Books:

CSL416 ADVANCED ALGORITHMS (3-0-2-4)
Pre-requisites: CSL201 DATA STRUCTURES, CSL308 ANALYSIS OF ALGORITHMS

Contents:

Practical: Practicals as per course contents.

Text Book:

Additional Books:
CSL418 PATTERN RECOGNITION AND MACHINE LEARNING (3-0-0-3)
Pre-requisites: NIL

Contents:


Text Book:

Additional Books:

CSL419 COMPUTER VISION AND IMAGE PROCESSING (3-0-0-3)
Pre-requisite: NIL

Contents:

Text Books:

Additional Book:

CSL420 OPTIMIZATION TECHNIQUES (3-0-0-3)
Pre-requisite: NIL

Contents:

Models ; Deterministic and probabilistic Models ; Optimization and Performance in Web Computing, Internet Application, Course of dimensionality.

Text Books:

Additional Books:

CSL421 RESEARCH METHODOLOGY (3-0-0-3)
Pre-requisite: NIL

Contents:

Text Books:

Additional Books:

CSL422 WIRELESS AND MOBILE COMMUNICATION (3-0-0-3)
Pre-requisites: CSL303 COMPUTER NETWORKS

Contents:


Text Book:

Additional Books:

CSL423 CLOUD ENABLED TECHNOLOGIES (3-0-0-3)
Pre-requisite: NIL

Contents:

Text Book:
1. Smith, James and Ravi Nair. Virtual Machines: Versatile Platforms for
CSL425 INTRODUCTION TO VIRTUALIZATION AND CLOUD COMPUTING (3-0-0-3)

Pre-requisite: NIL

Contents:

"Big data” concepts, storage and management: clustering, dynamic provisioning and resource management, security, scalability, privacy and other risks.

Case Study: Implementation examples of Cloud services

Text Book:

Additional Book:

CSL427 EMBEDDED SYSTEMS (3-0-0-3)

Pre-requisite: CSL202 COMPUTER ORGANIZATION

Contents:
Introduction to embedded systems: Classification, Characteristics and requirements, Applications.
Numbering and coding systems, Digital primer, inside the computer, The 8051 microcontrollers, introduction to 8051 assembly programming, Assembly and running an 8051 programs, the program counter and ROM space in the 8051, 8051 data types and directives, 8051 flag bits and the PSW register, 8051 register banks and stack, Loop and jump instructions, Call instructions, Time delay for various 8051 chips, 8051 I/O programming, I/O manipulation programming, Addressing modes (immediate and register addressing modes, accessing memory using various addressing modes, bit addresses for I/O and RAM, Extra 128-byte on-chip RAM in 8052, Ptn description of the 8051, Programming of 8051 timers, Counter programming, Basics of serial communication, 8051 connection to RS232, 8051 serial port programming in assembly, 8051 interrupts, Programming timer interrupts, Programming external hardware interrupts, Programming the serial communication interrupt, interrupt priority in the 8051/S2, LCD interfacing, Keyboard interfacing.

Case Studies: Addressing Modes, Ptn of 8051 and 8052.

Text Book:

Additional Books:

CSP401 SOFTWARE LAB (0-0-2-2)

Contents:
Main theme- Use of open source tools.
Advanced use of Apache Web server: Installing and using Apache Web server in load sharing manner (Configuration of 2 or more server hosting a common website, Advanced use of MySQL server: Installing and using mysql servers in load sharing manner (Configuration of 2 MySQL instances in master-slave mode).
Database operations via programs written in C/C++ or Java. Java Native Interface (JNI): Calling C/C++ code from Java and vice versa.