SEMESTER I

CS321: Advanced Java Programming (CR-5, L-4, P-2)

Java Basics Review: Java streaming, Networking, Event handling, Multithreading, Byte code Interpretation, Customizing application, Data Structures, Collection classes.
Distributed Computing: Custom sockets, Remote Method Invocation, Activation, Object serialization, Distributed garbage collection, RMI, IIOP, Interface definition language, CORBA, JINI overview.
Java Beans And Swing: Bean concepts, Events in bean box, Bean customization, Persistence, Application, deployment using swing, Advanced swing techniques, JAR file handling.
Java Enterprise Applications: JNI, Servlets, Java Server Pages, JDBC, Session beans, Entity beans, Programming and deploying enterprise Java Beans, Java transactions
Related Java Techniques: Java Media Frame work, 3D graphics, Internationalization, Case study, Deploying n-tier application, E-commerce applications.

Reference Books:

- Deitel & Deitel , "Java How to program" , Prentice Hall , 4 th Edition, 2000..
- Gary Cornell and Cay S. Horstmann, "Core Java Vol 1 and Vol 2", Sun Microsystems Press, 1999.
- Stephen Asbury, Scott R. Weiner, Wiley, "Developing Java Enterprise Applications", 1998.

CS322: Theory of Computation (CR-4, L-4, P-0)

Prerequisites: *Discrete Mathematics*

Introduction: Automata, Computability, and Complexity, Types of Proof.
Regular Languages: Finite Automata, formal definition, examples, designing finite automata, the regular operations.
Non-determinism: Formal definition, equivalence of NFAs and DFAs, closure under the regular operations. **Regular expressions:** Formal definitions, equivalence with finite automata.
Nonregular Languages: The Pumping lemma for regular languages.
Context-Free Languages: Context-free Grammars, formal definition, examples, designing context-free grammars, Ambiguity, Chomsky normal form.
Pushdown Automata: Formal definition, examples, equivalence with context-free grammars.
Non-context-free Languages: The pumping lemma for context-free languages.
The Church-Turing Thesis: Turing Machines, formal definition, examples.
Variants of Turing Machines: Multitape Turing Machines, Non deterministic Turing Machines, Enumerators, equivalence with other models, The Definition of Algorithm, Hilbert's problems.
Decidability: Decidable Languages and the Halting Problem.

Reference Books:

- John C Martin, "Introduction to Language and The Theory of Computation". TMH.
- M. Sipser, "Introduction to the Theory of Computation, Brooks/Cole Thomson Learning", 1996.
- H.R. Lewis and C.H. Papadimitrou, "Elements of the Theory of Computation, Prentice Hall Inc", 1999.
- J.E. Hopcroft, Rajeev Motwani and J.D. Ullman, "Introduction to Automata, Languages and Computation", Pearson ducation, 2002.
- Dexter Kozen, "Automata and Computability", Springer Verlag

CS323: Design Analysis of Algorithms (CR-5, L-4, P-2)

Prerequisites: *Data Structures*
Introduction: What is an Algorithm? Fundamentals of Algorithmic Problem solving, review of elementary data structures-Heaps and Heap sort, Hashing, Sets representation, UNION-FIND.
Fundamentals of the Analysis of Algorithm Efficiency: Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Nonrecursive and Recursive Algorithms, Example – Fibonacci Numbers.
Brute Force: Selection Sort and Bubble Sort, Sequential Search and Brute-Force String Matching, Exhaustive Search Divide and Conquer: Mergesort, Quicksort, Binary Search, Binary tree traversals and related properties, Multiplication of large integers and Stressen's Matrix Multiplication.
Decrease and Conquer: Insertion Sort, Depth First Search, Breadth First Search, Topological Sorting Transform and conquer: presorting, balanced search trees, heap and heap sort.
Space and Time Tradeoffs: Sorting by Counting, Input Enhancement in String Matching, Hashing.
Dynamic programming: Warshall's and Floyd's algorithms, the knapsack problem and memory functions.
Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees.
Limitations of Algorithm Power: Lower-Bound Arguments, Decision Trees, P, NP and NP-Complete Problems Coping with the Limitations of Algorithm Power: Backtracking, Branch-and-Bound, Approximation Algorithms for NP-Hard Problems.

Reference Books:

- T H Corman, C Leiserson, Rivest, Ronald and stein Clifford, "Introduction to algorithms", MGH, 2nd edition, New York, 2001.
- Anany Levitin, "Introduction to The Design & Analysis of Algorithms", 2nd Edition, Pearson Education, 2007.
- E Horowitz, S Sahni, S Rajasekaran, "Fundamentals of computer algorithms", universities press, 2nd edition, 2008.
- Introduction to the Design and Analysis of Algorithms A Strategic Approach, R.C.T. Lee, S.S. Tseng, R.C. Chang & Y.T.Tsai, TMH, 2005.

CS324 Database Systems (CR-5, L-4, P-2)

Introduction : Basic concepts, Advantages of a DBMS over file-processing systems, Data abstraction, Data Models and data independence, Components of DBMS and overall structure of DBMS, Data Modeling, entity, attributes, relationships, constraints, keys E-R diagrams, Components of E-R Model.
Relational Model: Structure, relational algebra, tuple and domain relational calculus, extended relational algebra operations, news and modifications.
SQL: Basic structure, set operations, aggregate functions, null values, data definitions, embedded SQL, other SQL features and views.
Exception handling: Exception as objects, Exception hierarchy, Try catch finally Throw, throws
Relational Database Design: Concept of integrity and referential constraints Notion of normalized relations, functional dependency, decomposition and properties of decomposition, Normalization using functional dependency, Multi-valued dependency and Join dependency.
Storage and file structure : Physical storage media, magnetic disks, RAID, territory storage, file organization, organization of records in files, data dictionary storage, storage structures for object oriented databases.
Indexing and hashing: Index sequential files, B-tree indexed files, B+ trees index files, static and dynamic hash functions, comparison
Query Processing: Query interpretations, equivalence of expressions, estimation of query processing cost, estimation of cost of access using indices, join strategies, structure of query optimizer.
Transaction processing and management : Transaction concept, transaction state, implementation Atomicity and Durability, Concurrent Executions, Serializability, Implementation of Isolation , Transaction definition in SQL, **Database system Architecture**: Centralized, Client Server, Parallel and Distributed Systems. Web enabled System

Reference Books:

- Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database system concepts", 5th Edition, McGraw Hill International Edition.
- Raghu Ramkrishnan, Johannes Gehrke, "Database Management Systems", Second Edition, McGraw Hill International Editions.
- Rob Coronel, "Database systems: Design implementation and management", 4th Edition, Thomson Learning Press.
- C.J.Date ,"An introduction to Database system" , 7th Edition, Pearson Education.

CS325: Operating System Concepts (CR-5, L-4, P-2)

Prerequisites: *Data Structures, Computer Organization and Architecture*

Introduction to system software- Assemblers, linkers, microprocessors, compilers, interpreters, loaders, compiler drivers, static linking, object files, relocatable object files, symbols and symbol tables, symbol resolution, relocation, executable object files, loading executable object files, dynamic linking with shared libraries, loading and linking shared libraries from applications, position independent code, tools for manipulating object files.
Computer system overview - CPU registers, interrupts, memory hierarchy, cache

memory, I/O communication techniques.
Operating system overview - objectives and functions, evolution of operating systems, characteristics of modern operating systems like windows, Unix, Linux Processes - process states, description, control, Unix SVR4 process management, processes and threads, symmetric multiprocessing, microkernels, windows thread, SMP management, Solaris thread, Linux process and thread management.
Concurrency: mutual exclusion and synchronization- principles of concurrency, mutual exclusion-software approaches and hardware support, semaphores, monitors, message passing, readers-writers problem, concurrency deadlocks, and starvation – principles of deadlock, deadlock preventation, deadlock avoidance, detection, integrated deadlock strategy, dining philosophers problem, Unix concurrency mechanisms, Solaris thread synchronization primitives, windows concurrency mechanisms.
Memory management- its requirements, memory partitioning, paging, segmentation, virtual memory - hardware control structures, operating system software, Unix and Solaris memory management, Linux memory management, windows memory management.
Scheduling – Uniprocessor scheduling - types, scheduling algorithms, traditional Unix scheduling multiprocessor and real time scheduling: Unix scheduling, Windows scheduling.
IO management and disk scheduling - IO devices, organization of IO function, OS design issues, IO buffering, disk scheduling, raid, disk cache, Unix IO, Windows IO
File management - file organization, directories, file sharing, record blocking, secondary storage management, Unix and Windows file management.

Reference Books:

- William Stallings, "Operating systems: internals and design principles", Pearson Education B.V. Pathak, Nirali Prakashan, *Communication Skill.*
- Silberschatz, Galvin, "Operating System Concepts", Addison Wesley

SEMESTER-II

CS326: Data Communication and Networking (CR-4, L-4, P-0)

Prerequisites: *Data Structures, Computer Organization and Architecture*

Introduction, Network Models- ISO OSI model and Introduction to TCP/IP suite, Data and Signals, Digital Transmission, Analog Transmission, Bandwidth Utilization: Multiplexing and Spreading, Transmission Media, Switching, Using Telephone and Cable Networks for Data Transmission, Error Detection and Correction, Data Link Control, Multiple Access, Wired LANs: Ethernet, Connecting LANs, Backbone Networks, and Virtual LANs, SONET/SDH, Virtual-Circuit Networks: Frame Relay and ATM, Introduction to IP Addressing

Reference Books:

- Behrouz A. Forouzan, "Data Communications and Networking", 4/e., TMH.
- Andrew S. Tanenbaum, "Computer Networks". Prentice-Hall.
- Uyless Black, "Computer Networks", Pearson Education.
- William Stallings, "Data and Computer Communications". Prentice-Hall**.**

CSE327: Compiler Design and Optimization (CR-5, L-4, P-2)

Prerequisites: *Theory of Computation, Data Structures*

Introduction: Analysis of the source program, phases of a compiler, compiler construction tools.
Lexical analysis: Role of lexical analyzer, input buffering, specification and recognition of the tokens, a language for specifying lexical analyzers optimization of DFA.
Syntax analysis: Role of parser, context free grammars, top down and bottom up parsing operator precedence parsing. LR parsers, using ambiguous grammars, parser generators.
Syntax directed translation: Definition, construction of syntax trees, bottom up evaluation of S-attributed definitions, L-attributed definitions, top down translation, bottom up evaluation of inherited attributes recursive evaluators, space for attribute values at compiler time, type checking.
Run-time environments: Source language issues, storage organization, access to nonlocal names, parameter passing, symbol tables, dynamic storage allocation techniques.
Intermediate code generation: Intermediate language, declarations, assignment statements, Boolean expressions, case statements, back patching, procedure calls.
Code Generation: Issues in the design of a code generator, the target machine, run time storage management, basic blocks and flow graphs, next use information, a simple code generator, register allocation and assignment, the dag representation of basic blocks, peephole optimization, generating code from dag, code-generator generators.

Reference Books:

- Andrew W. Appel, "Modern Compiler Implementation in JAVA".
- Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, "Compilers principles, techniques and tools", Addison Wesley.
- Damdhere D.M., "Compiler construction, principle and practice", MacMillan publisher.
- Holab A.J., "Compiler design in C", PHI

CS328: Software Engineering (CR-4, L-4, P-0)

The Product and the Process: The Product: The evolving role of software, s/w characteristics, s/w applications, software myths.
The process: Software engineering, software process, software process models, linear sequential model, prototyping model, the RAD model, evolutionary software process models, component-based development, the formal methods model
Managing Software projects: Project management concepts- The management spectrum, people, the product, and the process.
Software process and project metrics: Measures, metrics and indicators, s/w measurement, metrics for s/w quality, integrating metrics within s/w engineering process, managing variation, establishing s/w metrics program.
Software Project Planning: Project planning objectives, software scope, resources, software project estimation, decomposition techniques.
Risk analysis and management: reactive versus proactive risk strategies, software risks, risk identification, risk projection, risk refinement, risk mitigation, monitoring and management, safety risks and hazards.
Project scheduling and tracking: basic concepts, the relationship between people and effort, defining a task set for the software project.
Software quality assurance: Quality concepts, the quality movement, software quality assurance and software reviews.
Conventional Methods for Software Engineering: System Engineering: Computer based systems, system engineering hierarchy, business process engineering, product engineering, requirements engineering, system modeling.
Analysis Modeling: data modeling, functional modeling and information flow, behavioral modeling, the mechanics of structured analysis, the data dictionary.
Design concepts and principles: s/w design and s/w engineering, design process, design principles, design concepts, effective modular design, design documentation.
Architectural design: Software architecture, data design, mapping requirements into a software architecture, transform mapping, transaction mapping.
User interface design: golden rules, user interface design, task analysis and modeling, interface design activities, implementation tools.
Software testing techniques: Testing fundamentals, test case design, white box testing, basis path testing, control structure testing, black box testing, testing for specialized environments, architectures and applications.
Software testing strategies: a strategic approach, strategic issues, unit testing, integration testing, validation testing, system testing and the art of debugging.

Reference Books:

- Stephen R. Schach, "Object oriented and Classical software Engineering", TMH edition..
- David Gustafson, "Software engineering", TMH edition.
- Pankaj Jalote, "Software Project Management in Practice", Pearson*:* Education
- Pressman, "Software Engineering", fifth edition, McGraw Hill. Ghezzi, Jazayeri and Mandrioli, "Fundamentals of software Engineering", 2/e, Prentice Hall. Ian Sommerville, "Software Engineering", Pearson education Asia.

CS329: UNIX & System programming (CR-5, L-4, P-2)

Prerequisites: *Operating System Concepts* computers, designing for performance.

Introduction: System structure, user perspective, operating system services, system commands, assumption about hardware
Shell Programming: Bourne shell and C shell programming, variables, constants, environments, control structures, shell scripts examples
Introduction to kernel: Architecture of the UNIX operating system, introduction to system concepts, kernel data structures, and system administration
Buffer Cache: Buffer headers, structure of buffer pool, scenarios for retrieval of a buffer, reading and writing disk blocks

Internal Representation of Files: Inodes, Structure of a regular file, directories, Conversions of a path name to I node, super Block, I node assignment to a new file, allocation of disk blocks, other file types
System Calls of the file systems : Open, read, write, file and record locking, lseek, close, file creation, creation of special files, change directory and change root, change owner and change mode, stat and fstat , pipes, dup, mounting and unmounting file system, link and unlink, file system abstraction, file system maintenance
Structure of Processes: Process states and transitions, layout of system memory, the context of a process, saving the context of a process, manipulation of the process address space, sleep
Process Control : Process creation, signals, process termination, awaiting process termination, invoking other programs, UID of a process, changing the size of a process, The shell, system boot and the init process.
Memory management policies: Swapping, demand paging, a hybrid system with swapping and demand paging **I/O Subsystem:** Driver interfaces, disk drivers, terminal drivers.
Interprocess communication: Process tracing, system V IPC, network communications, sockets

Reference Books:

- M. J. Bach, "The Design of the UNIX operating Systems", *PHI*.
- Richard Stevens, "UNIX Network Programming", *PHI*.
- John Muster, "UNIX made easy", Third Edition, *TMH Edition*.

CS330: Digital Signal Processing (CR-5, L-4, P-2)

Introduction: Anatomy of digital filter, frequency domain description of signals and systems, application of DSP**.**
Discrete time description of signals and systems: Discrete time sequences, superposition principal for linear systems, unit sample response, time invariant systems, stability criterion for discrete time systems, causality criterion for discrete time systems, linear constant coefficient difference equations
Fourier transform of discrete time signals: Definition of Fourier transform, its properties, properties of FT for real valued sequences, use of FT, FT of special sequences, inverse FT, FT of product of two sequences, sampling a continuous function to generate a sequence, reconstruction of continuous time signals from discrete time signals.
Discrete Fourier transform: Definition of DFT, computation of DFT, its properties, circular convolution, performing linear convolution with DFT, DIT and DIF algorithms for FFT, Comments about FFT and its performance, other realizations of DFT.
Z Transform: Definition and its properties, system function of a digital filter, combining filter sections to form complex filters, digital filter implementation from system function, complex z plane, ROC in Z plane, determining filter coefficients from singularity locations, geometric evaluation of Z transform in z plane, relation of Z transform to FT, Z transform of symmetric sequences, Inverse Z Transform.
Digital filter structures: Filter categories, Direct form First & second Form structures, cascade and parallel combinations of second order sections, linear phase FIR filter structures, frequency sampling structure for FIR filter FIR and IIR filter design techniques and inverse filtering.

Reference Books:

- Roman Kuc, "Introduction to DSP", McGraw Hill Publication.
- R. G. Lyons, "Understanding DSP", Addison Wesley publication.

CS331: Technical Seminar (CR-1, L-0, P-2)

Each student must select a technical seminar topic based on current trends in Computer Science and engineering. He/she must explore information on the selected topic using reference books, journals, Internet, Magazines, etc. finally Student has to deliver a seminar using audio/video aids. The credits will be allotted based on his efforts, subject knowledge.

CS420 (Audit): Industrial Training/ Mini-project /Technical Training

Every student should undergo industrial training or technical training for a period of one month during summer vacation. In case the students do not get an opportunity for training as mentioned he/she can do mini-project in summer vacation in the institute. He/she has to prepare and submit report which will be evaluated through the seminar given by student in the first term of the final year.

The following are practical details for TY CSE students.

CS321: Advanced Java Programming (CR-5, L-4, P-2)

1. Write a program to prompt the user for a hostname and then looks up the IP address for the hostname and displays the results.
2. Write a program to read the webpage from a website and display the contents of the webpage.
3. Write programs for TCP server and Client interaction as per given below. i. A program to create TCP server to send a message to client. ii. A program to create TCP client to receive the message sent by the server.
4. Write programs for Datagram server and Client interaction as per given below. i. A program to create Datagram server to send a message to client. ii. A program to create Datagram client to receive the message sent by the server.
5. Write a program by using JDBC to execute a SQL query for a database and display the results.
6. Write a program by using JDBC to execute an update query with and without using PreparedStatement and display the results.
7. Write a program to execute a stored procedure in the database by using CallableStatement and display the results.
8. Write a program to display a greeting message in the browser by using HttpServlet.
9. Write a program to receive two numbers from a HTML form and display their sum in the browser by using HttpServlet.
10. Write a program to display a list of five websites in a HTML form and visit to the selected website by using Response redirection.
11. Write a program to store the user information into Cookies. Write another program to display the above stored information by retrieving from Cookies.
12. Write a program in Java Beans to add a Button to the Bean and display the number of times the button has been clicked.
13. Write a program for Java Bean with Simple property and Indexed Property by using SimpleBeanInfo class.
14. Write a program to develop a Enterprise Java Bean of "Session Bean" type, "Entity Session Bean" type and "Message Driven Bean" type.

CS323: Design Analysis of Algorithms (CR-5, L-4, P-2)

Searching and sorting algorithms, Greedy algorithms, algorithms using Divide and Conquer method, Dynamic programming based algorithms, Prim's algorithm, Kruskal's algorithm, Dijkstra's algorithm, Nqueen Problem, backtracking.

CS324: Database Systems (CR-5, L-4, P-2)

Experiments in the following topics:
Data Definition, Manipulation of base tables and views
High level programming language extensions
Front end tools
Forms, Triggers, Menu Design
Importing/ Exporting Data, Reports.
Database Design and implementation (Mini Project).

CS325: Operating System Concepts (CR-5, L-4, P-2)

Implementation of Simaphores, monitors, Simulation of Page management, Segmentation, scheduling algorithms

CS327: Compiler Design and Optimization (CR-5, L-4, P-2)

Use compiler generator tools to implement the Scanner, Parser, Type checker and Intermediate code generator for different statements and expressions like Assignment statements, Expressions with subscripted variables, Boolean expressions, and Control structures. Use any high level language for flow graph construction from intermediate code and code generation for the given machine specification.

CSE329: UNIX & System programming (CR-5, L-4, P-2)

Basic UNIX commands,
Shell Programming.
Grep, sed, awk.
File system related system calls.
Process management – Fork, Exec.
Message queues.
Pipes, FIFOs.
Signals.
Shared memory.
Semaphores

CS330: Digital Signal Processing (CR-5, L-4, P-2)

Generation of discrete time sinusoidal signals with varying frequency, program for linear convolution, DFT and its properties, IDFT, circular convolution and linear convolution using circular convolution, MATLAB filter design tools.