Department of Computer Science and Engineering

The following shall be the scheme of instruction and examination for **B.Tech Third Year** Computer Science and Engineering **From Academic year 2016-17**

Type/ Code	Name of the Course	Credits	Lectures/ Week	Tutorials/ Week	Practical/ Week
		Semester - I			
CS322	Theory of Computation	04	03	01	--
CS323	Design and Analysis of Algorithms	04	03	----	02
CS324	Database Systems	04	03	---	02
CS325	Operating System Concepts	05	03	01	02
CS332	Elective-I	04	03	-	02
CS333	Computer Lab - III	01	---	----	02
OE	Institute Open Elective (Over and Above) Additional credit	**	**	-	-
Total		22	15	02	10
		Semester - II			
CS327	Compiler Design and Optimization	04	03	----	02
CS328	Software Engineering	04	03	01	--
CS329	Unix System Programming	04	03	---	02
CS334	Data Communication and Networking	04	03	01	--
CS331	Technical Seminar	01	--	--	02
CS335	Elective – II	04	03	--	02
CS336	Computer Lab - IV	01	----	----	02
OE	Institute Open Elective (Over and Above) Additional credit	**	**	-	-
Total		22	15	02	10
Industrial Training/Internships/Reputed Certificate Course[Additional Credit]		Students wish to go for any industrial training or internships or Reputed Certificate Course at the end of II Semester of Third Year has to do prior registration in the Department and their performance will be assessed in the First Semester of B.Tech. However this will not be mandatory and shall be considered as an additional credit.			

The list of Electives offered:

Elective – I (PE)			**Elective – II (PE)**	
CS332A	Advanced Java Programming		CS335A	Interactive Python Programming
CS332B	Advanced C Programming		CS335B	Combinatorics, Probability and Statistics
CS332C	Number Theory and Applications		CS335C	Digital Signal Processing
CS332D	Microcontrollers		CS335D	Information Theory and Coding

Note: Students wish to study open elective can register for such courses over and above in both the semesters. This will not be mandatory & shall be considered as additional credit.

SEMESTER I

CS322
Theory of Computation (CR-4, L-3, T-1, 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 NFA's And DFA's, 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:

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

CS323
Design and Analysis of Algorithms (CR-4, L-3, T-0, 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: Merge sort, Quicksort, Binary Search, Binary tree traversals and related properties, Multiplication of large integers and Strassen'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:

1. T H Corman, C Leiserson, Rivest, Ronald and stein Clifford, "Introduction to algorithms", MGH, 2nd edition, New York, 2001.
2. Anany Levitin, "Introduction to The Design & Analysis of Algorithms", 2nd Edition, Pearson Education, 2007.
3. E Horowitz, S Sahni, S Rajasekaran, "Fundamentals of computer algorithms", universities press, 2nd edition, 2008.
4. 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-4, L-3, T-0, 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 Notation of normalized relations, functional dependency, decomposition and properties of decomposition, Normalization using functional dependency, Multi-valued de-pendency 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:

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

CS325
Operating System Concepts (CR-4, L-3,T-1, 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- Memory 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:

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

CS332 Elective I

CS332A
Advanced Java Programming (CR-4, L-3, T- 0, 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:

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

CS332B
Advanced C Programming(C-4, L-3,T-0,P-2)

Prerequisites: Introduction of C, Data-types, Decision Statements, Loop Control, Array, String and Standard functions.

Pointers: Introduction, void pointers, Wild pointers, Constant pointer, Pointer and Arrays, Arrays of pointer, pointer to pointer, Pointers and Strings.

Functions: Types of Function, Pass Array to Function, Nested Function, Recursion, Type of Recursion- Direct Recursion, Indirect Recursion, Recursion various Iteration, Tower of Honai.

Storage Classes: Automatic Variables, External Variables, Static Variables, Static External Variables, Register Variables.

Preprocessor Directrives: The #define Directive, ,The #include Directive, Conditional Compilation, The #ifndef Directive, The #error Directive , The #line Directive, The #pragma inline Directive, The #pragma saveregs, The #pragma Directive.

Structure and Union: Features of Structures, Declaration and Initialization of Structures, Structure within Structure, Array of Structures, Pointer to Structure, Structure and functions, typedef, Bitfields, Enumerated Datatype, Calling BIOS and DOS services, Union of Structures.

Files: Reading/Writing Files, Low-Level Disk I/O, Command Line Arguments, Applications of Command Line, arguments, Environment Variables, I/O Redirection.

Reference Books:

1. Ashok N kamthane ***"Programming in c"*** 2nd Edition Pearson Education.
2. E Balgurusamy ***"Programming in ANSI C"*** *Tata McGraw-Hill*

CS332C
Number Theory and Application (C-4, L-3, T-0, P-0)

Divisibility and Factorization : Divisibility: Definition, properties, division algorithm, greatest integer function ,Primes: Definition, Euclid's Theorem, Prime Number Theorem (statement only), Goldbach and Twin Primes conjectures, Fermat primes, Mersenne primes ,The greatest common divisor: Definition, properties, Euclid's algorithm, linear combinations and the gcd ,The least common multiple: Definition and properties, The Fundamental Theorem of Arithmetic: Euclid's Lemma, canonical prime factorization, divisibility, gcd, and lcm in terms of prime factorizations ,Primes in arithmetic progressions: Dirichlet's Theorem on primes in arithmetic progressions (statement only)

Congruences: Definitions and Basic Properties, Residue Classes, Complete Residue Systems, Reduced Residue Systems , Linear Congruence's In One Variable, Euclid's Algorithm ,Simultaneous Linear Congruences, Chinese Remainder Theorem ,Wilson's Theorem ,Fermat's Theorem, Pseudo primes And Carmichael Numbers ,Euler's Theorem.

Arithmetic functions: Arithmetic Function, Multiplicative Functions: Definitions And Basic Examples The Moebius Function, Moebius Inversion Formula ,The Euler Phi Function, Carmichael Conjecture ,The Number-Of-Divisors And Sum-Of-Divisors Functions Perfect Numbers, Characterization Of Even Perfect Numbers.

Quadratic residues: Quadratic Residues And Nonresidues, The Legendre Symbol: Definition And Basic Properties, Euler's Criterion, Gauss' Lemma , The Law of Quadratic Reciprocity.

Primitive roots: The Order of an Integer, Primitive Roots: Definition And Properties, The Primitive Root Theorem: Characterization Of Integers For Which A Primitive Root Exists.

References:

1. Text: James Strayer, Elementary Number Theory, Waveland Press, 1994/2002, ISBN 1-57766-224-5

Alternate texts (available on library reserve):

1. Kenneth Rosen, Elementary Number Theory and its Applications, 5th Edition, McGraw Hill, ISBN 0-201-87073-8.

2. Niven, H. Zuckerman, H. Montgomery, an Introduction to the Theory of Numbers, 5th Edition, Wiley, ISBN 0471625469.

CS332D
Microcontrollers (C-4, L-3, T-0, P-2)

8051: Architecture of 8051 Memory Organisation , Register Banks , Bit addressable area , SFR area, Addressing modes, Instruction set - Programming examples

8051 Interrupt Structure - Timer modules, Serial features, Port structure, Power saving modes.

ARM PROCESSORS: ARM Programmer's Model, Registers, Processor Modes, State of the processor, Condition Flags, ARM Pipelines, Exception Vector Table, ARM Processor Families, Introduction to ARM Memory Management Unit.

ARM Addressing Modes – ARM Instruction Set Overview , Thumb Instruction Set Overview - LPC210X ARM Processor Features

RASPBERRY PI: Introduction, Raspberry Pi overview & specs, Programming with Raspberry Pi

TYPICAL APPLICATIONS: Stepper Motor Control - DC Motor Control - AC Power Control - Introduction to micro controller development tools

REFERENCES:

1. "8-bit Embedded Controllers", Intel Corporation, 1990.
2. John Peatman, "Design with Microcontrollers", McGraw Hill, Singapore, 1988.
3. John B Peatman, "Design with PIC Microcontrollers", Pearson Education Inc, India, 2005.
4. ARM System Developer's Guide", Andrew Sloss, Morgan Kaufmann Publishers, 2005
5. Steve Furber, "ARM System-on-Chip Architecture", Pearson Education, 2005
6. "LPC210x ARM Processor Datasheet" Rev. 5, Philips Electronics, 2004
7. "ARM7TDMI Technical Reference Manual", ARM Ltd., UK, 2004
8. Raspberry Pi Cookbook: Software and Hardware Problems and Solutions Paperback – 2014, by Simon Monk, O'Reilly Publication, First Edition (2014).

CS333
Computer Lab-III

PHP & JQuery

Core PHP, Introduction to PHP, Web Server, Xampp, Installation and Configuration, Evaluation of PHP, Basic Syntax ,Defining Variable and constant, PHP Data type, Operator and Expression , Syntax, Operators, Variables, Constants, Control, Structure, Language construct and functions, Function Syntax, Arguments, Variables, References, Returns and Variable Scope, Arrays-Enumerated Arrays, Associative array, array iteration, Multi-dimensional array, Handling Html Form With PHP, Capturing Form Data, Dealing with Multi-value filed, Generating File uploaded form,, Redirecting a form after submission, Web Features, Sessions, Forms, GET and POST data, Cookies, HTTP Header, Writing, File System functions, Streams File Uploading and File Downloading. Introduction to JQuery, Validation JQuery, JQuery Forms, JQuery Examples and any other topics/tools/concepts based on recent technology as per the discretion of subject teacher.

OE
Institute Open Elective

It is not mandatory course for the students however Student wish to study open elective can register for such courses over and above. It will be considered as an additional credit.

SEMESTER-II

CS327
Compiler Design and Optimization (CR-4, L-3,T-0, 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:

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

CS328
Software Engineering (CR-4, L-3, T-1, 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, and 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:

1. Stephen R. Schach, "Object oriented and Classical software Engineering", TMH edition..
2. David Gustafson, "Software engineering", TMH edition.
3. Pankaj Jalote, "Software Project Management in Practice", Pearson*:* Education
4. 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-4, L-3, T-0, 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:

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

CS334
Data Communication and Networking (CR-4, L-3,T-1, 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:

1. Behrouz A. Forouzan, "Data Communications and Networking", 4/e., TMH.

2. Andrew S. Tanenbaum, "Computer Networks". Prentice-Hall.
3. Uyless Black, "Computer Networks", Pearson Education.
4. William Stallings, "Data and Computer Communications". Prentice-Hall.

CS331
Technical Seminar (CR-1, L-0,T-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.

CS335 Elective II

CS335A
Interactive Python Programming (C-4, L-3, T-0, P-2)

Introduction to Python: Introduction to Python, Introduction to Python Interpreter , Byte Code Compilation, The Python Virtual Machine, Python Implementation alternatives-cpython, jpython, Ironpython, How to Run Python Programs, Running File with Command Line, Using Executable Scripts.

Basics of Python: Values and Types, Identifier, Variables names and keyword, Reading Input from the console, Formatting Output, Assignment statements, Simultaneous assignments, Named Constants.

Operators and Expressions: Introduction, Operators and Expressions, Arithmetic Operators, Binary Operators: Addition(+), Subtraction(-), Multiplication(*), Integer Division, Floor Division and Modulus operators(%),Exponent (**), Unary Operators(Addition and Subtraction Operators), Operator Precedence and Associativity, Changing Precedence and Associativity of the arithmetic Operators, Translating Mathematical Formulas Into Equivalent Python Expressions, Bitwise Operator: The Bitwise AND (&) Operator, The Bitwise OR (|)Operator, The Bitwise XOR (^) Operator, The Right Shift (>>)Operator, The Left Shift (<<) Operator, The Compound Assignment Operator

Decision Statements: Introduction, Boolean Type , Boolean Operators, Using Numbers with Boolean Operators, Using String with Boolean Operators, Boolean Expressions and Relational Operators, The if Statements, The if-else Statement, Nested if statements, Multi-way *if-elif-else* Statements, Conditional Expressions.

Loop Control Statements: Introduction, The While loop, The range() function, The *for* Loop, Nested Loops, The *break* Statement, The *continue* Statement.

Function: Introduction, Passing Parameters to function, Positional Arguments, Keyword Arguments, Parameter with Default Values, The Local Scope of Variable, The *return* statement, Returning Multiple Values, Assign Returned Multiple Values to Variable(s), Recursive Functions,

Class and Inheritance : Introduction, Class definition, Class objects and its construction, Construction of objects, Accessing member's of object, init() method and self-parameter, Mutable and immutable objects, Class variables and instance variables, Inheritance, Method Overriding and Overloading, Multiple Inheritance, Abstraction And Encapsulation, Polymorphism.

Strings: The str class, The Index Operator, Access Characters via Negative Index, Traversal with a for Loop, Strings are Immutable, The String Slicing Operator [start: end], String Slicing With Step Size, The String Operators, String Comparison, Various Methods of *str* (String) Class, The split() method, Testing String, Searching Substring in a String, Methods to convert a String to another String, Stripping Unwanted characters from a String, Formatting String.

List and Multidimensional List: Creating Lists, Accessing Elements of a List, Negative List Indices, List Slicing [Start: end], List Slicing With Step Size, Python Built-in Functions for Lists, The List Operator (The **+** Operator, The ***** Operator, The **in** Operator, The **is** Operator, The **del** Operator), List Comprehensions, List Methods(append( ), count( ), copy( ), extend( ), index( ), insert( ), pop( ), remove( ), reverse( ), sort( )) , List and Strings, Splitting a String in List, Passing List to a Function, Returning List from a Function. Processing two dimensional list, Passing two dimensional list to a function.

List Processing: Linear/Sequential Search, Unordered List Analysis of Sequential Search, Sorted List – Analysis of Sequential Search, The Binary Search, Sorting Algorithms: Selection Sort, Insertion Sort.

Sets, Tuples and Dictionary: Tuples And Mutability, Tuple Assignment, Tuple As Return Values, Sets, Dictionaries, Dictionary Operations, Dictionary Methods, Aliasing and Copying, Counting Letters.

Graphical User Interface in Python: Gui Basics, Tkinter widgets- Button, CheckButton, Frame, Label, Labelframe, RadioButton, Scrollbar, Progress bar, Menus, Popup Menus, Displaying Images, Canvas and Animations.

Python- Database Access: MYSQLdb, Installing MYSQLdb, Database Connection, Creating Database Table, Database Operation- Insert, Update, Delete, Commit, Rollback.

Reference Books:

1. Mark Lutz, Programming Python O'REILLY.
2. John M. Zelle Python Programming: Introduction to Computer Science

CS335B
Combinatorics, Probablity and Statistics(C-4, L-3, T-0,P-0)

Combinatorics:

Basic combinatorial numbers, selection with repetition, pigeon hole principle, Inclusion-Exclusion Principle, Double counting; Recurrence Relations, Generating functions; Special combinatorial numbers: Sterling numbers of the first and second kind, Catalan numbers, Partition numbers; Introduction to Ramsey theory; Combinatorial designs, Latin squares; Introduction to Probabilistic methods, Introduction to Linear algebra methods.

Probability and Statistics:

Probability Spaces and Continuity of Probability Measures, Random Variables and Expectation, Moment Inequalities, Multivariate Random Variables, Sequence of Random Variables and Different Modes of Convergence, Law of Large Numbers, Markov Chains, Statistical Hypothesis Testing, Exponential Models, Introduction to Large Deviations.

Reference Books:

1. R. P. Grimaldi, B. V. Ramana, "Discrete and Combinatorial Mathematics: An applied introduction", Pearson Education (2007)
2. Richard A Brualdi, "Introductory Combinatorics", Pearson Education, Inc. (2004)
3. Miklos Bona, "Introduction to Enumerative Combinatorics", Mc Graw Hill (2007)
4. An Introduction to Probability and Statistics by Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh, Wiley, 2nd edition 2000.
5. An Intermediate course in Probability, by Allen Gut, Springer, 2008.

CS335C
Digital Signal Processing (CR-4, L-3, T-0, 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:

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

CS335D
Information Theory and Coding (CR-4, L-3, T-0, P-2)

Source Coding: Definition and Examples, Uniquely decodable codes, Instantaneous codes, Constructing Instantaneous codes, Kraft's Inequality, McMillan's Inequality.

Optimal Codes: Optimality, Binary Huffman Codes, Average word length of Huffman codes, r-ary, Huffman codes, Extensions of sources.

Entropy: Information and Entropy, Properties of entropy function, Entropy and average word length, Shannon fano coding, entropy of extensions and products, Shannon's first theorem, Example of Shannon's first theorem.

Information Channels: Notations and definitions, Binary symmetric channel, System entropies, Mutual Information, Channel Capacity.

Using an unreliable channel: Decision rules, Example of improved reliability, Hamming distance, proof of Shannon's theorem, Converse of Shannon's theorem.

Error correcting codes: Introductory concepts, Examples of codes, Minimum distance, Hamming's sphere packing Bound, The Gilbert-Varshamov Bound, Hadamard Matrices and codes.

Linear codes: Matrix Description of Linear Codes, Equivalence Of Linear Codes, Minimum Distance Of Linear Codes, Hamming Codes, Golay Codes, Standard Array, Syndrome Decoding.

Reference Books:

1. S Gravano, "*Introduction to Error Control Codes*", Oxford University Press 2007.
2. R Bose, "*Information Theory, Coding and Cryptography*", TMH 2007.
3. Gareth Jones and J.Mary Jones, *"Information and coding theory"*, Springer Publication.

CS336
Computer Lab – IV

Mobile Application Development

History Behind Android Development, What is Android?, Pre-requisites to learn Android, Brief Discussion on Java Programming, Android Features, Installing Android Machine, Configuring Android Stack, Creating Eclipse Environment, Integrating Android with Eclipse IDE, Exploring Eclipse IDE, Creating First Android Application, Creating Android Project, Debugging Application through DDMS, Setting up environment, AVD Creation, Executing Project on Android Screen, Android Components, Activities, Services, Content Providers, Hello World App, Creating your first project, The manifest file, Layout resource, Running your app on Emulator, Building UI with Activities, Activities, Views, layouts and Common UI components, Creating UI through code and XML, Activity lifecycle, Intents, Communicating data among Activities, Advanced UI, Selection components (GridView, ListView, Spinner), Adapters, Custom Adapters, Complex UI components, Building UI for performance, Menus, Creating custom and compound Views. Introducing SQLite, SQLite Open Helper and creating a database, Opening and closing a database, working with cursors Inserts, updates, and deletes, Network. Location Based Services and Google Maps, Using Location Based Services, Finding current location and listening for changes in location, Proximity alerts, Working with Google Maps, Showing google map in an Activity, Map Overlays, Itemized overlays, Geocoder, Displaying route on map and any other topics/tools/concepts based on recent technology as per the discretion of subject teacher..

OE
Institute Open Elective

It is not mandatory course for the students however Student wish to study open elective can register for such courses over and above. It will be considered as an additional credit.