Syllabus

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For

B.Sc. in Computer Science and Engineering
(8 Semesters)
Session: 2019-2020
(11th Batch)

Department of Computer Science & Engineering
Faculty of Science

JagannathUniversity
Dhaka-1100

Detail Course Syllabus

1st Year 1st Semester(1st Semester)

CSE-1101 Structured Programming Language **Marks: 100 Credits:3.00**

Data types, operators, expressions, control structures; Functions and program structure: parameter passing conventions, scope rules and storage classes, recursion; Header files; Preprocessor; Pointers and arrays; Strings; Multidimensional array; User defined data types: structures, unions, enumerations; Input and Output: standard input and output, formatted input and output, file access; Variable length argument list; Command line parameters; Error Handling; Graphics; Linking; Library functions.

Reference language: C

Books Recommended :

1. H. Shildt, C/C++ Complete Reference.
2. H. Schildt, Teach yourself C
3. C How to Program, Deitel&Deitel
4. Programming with C, E. Balagurusamy

CSEL-1102 Structured Programming Language LabMarks:50 Credits: 1.50

Laboratory classes are based on course CSE-1103. The goal of this lab is to provide students with the skills needed to effectively design, develop, implement, debug, test, and maintain programs and more generally to solve problems using a computer. Students will be asked to solve various problems in a regular basis to increase their programming ability. Student should clearly understand the purpose of header(.h) and source(.c) files. Learn to writing Makefile and use of make for compilation and linking. The student will use both the integrated development environment(such as eclipse) and command line compilation to run programs.

CSER-1103 Mathematics-I (Calculus)Marks :100 Credits :3.00

Differential Calculus: Function and their graphs: Polynomial and rational functions, logarithmic and exponential functions, trigonometric functions and their inverses, hyperbolic functions and their inverses, combination of such functions.**Limits of Functions:**Definition. basic limit theorems with proofs, limit at infinity and infinite limits,continuous functions. algebra of continuous functions,properties of continuous functions on closed and boundary intervals (no proof required).**Differentiation:**definition of derivative,one-sided derivatives,rules of differentiation (proofs and applications),successive differentiation,Leibnitz theorem andrelated problems, linear approximations and differentials.Rolle's theorem, Lagrange's and cauchy's mean value theorems. Problems involving maxima and minima,concavity and points of inflection,Taylor's theorem with general form of the remainder, Lagrange's and Cauchy's forms remainder, Taylor's series, Differentiation and integration of series,validity of Taylor expansions and computations with series, indeterminate forms,L, Hospital's rules.

Integral calculus: Antiderivatives and indefinite-integrals,techniques of integration,definite integration using antiderivatives,definite integration using Riemann sums,fundamental theorems of calculus,basic properties of integration, integration by reduction.**Application of integration :** Plane areas,solids of revolutions,volumes by cylindrical shells, volumes by cross-sections, arc

length surface area of revolution.Improper integrals,gamma and beta functions,graphing in polar co-ordinates,successive integrations,area and length in polar coordinates.

Books Recommended:

1. Calculus with Analytic Geometry, Howards Anton
2. Dr.Md. Abdul Matin&BidhbusonChakraborty, Differential Calculus.
3. Calculus –Thomas Finley.

CSER-1104Physics **Marks :100 Credits :3.00**

Waves and Oscillations: Simple harmonic motion: Differential equation of a simple harmonic oscillator, Total energy and average energy, Combination of simple harmonic oscillations, Lissajous figures, Spring-mass system, Calculation of time period of torsional pendulum, Damped oscillation, Forced oscillation, Resonance; Wave: basic definitions, Differential equation of a progressive wave, Power and intensity of wave motion, Stationary wave, Group velocity and phase velocity; Architectural acoustics, Reverberation and Sabine's formula.

Properties of Matter: Crystalline and non-crystalline solids, Unit cell, Lattice and Basis, Bravais Lattices, Crystal Planes and Miller indices, Interplanar Spacing, Simple crystal structures: NaCl, CsCl, Bragg's Law, methods of determination of crystal structure; Defects in solids: point defects, line defects; Bonds in solids, inter-atomic distances, calculation of cohesive and bonding energy; Introduction to band theory: distinction between metal, semiconductor and insulator; Dielectric Properties of matter: Meaning of Dielectric, Magnetic properties of matter: Different types of magnetic materials; Introduction of superconductivity.

Electricity and Magnetism: Electrostatics: Fields, Potentials, Capacitors and Dielectrics; Steady-State Current, RC Circuits, Time Varying Current And Fields, Steady-State Magnetic Fields, Electromagnetic Induction, Maxwell's Equations, Poynting's Theorem, Wave Equation, Waves in Vacuum and in Materials, Transmission and Reflection at Boundaries, Guided Waves, Dispersion.

Books Recommended:

1. David Halliday& Robert Resnick, Physics Part I and Part-II.
2. N. Subrahmanyam, BrijLal, Optics.
3. N. Subrahmanyam, BrijLal, Heat and Thermodynamics.

CSE-1106 Electrical Circuit Analysis **Marks: 100 Credits:3.00**

Circuit variables and elements: Voltage, current, power, energy, independent and dependent sources, resistance. Basic laws: Ohm's law, Kirchhoff's current and voltage laws. Simple resistive circuits: Series and parallel circuits, voltage and current division, wye-delta transformation. Techniques of circuit analysis: Nodal and mesh analysis including supernode and supermesh. Network theorems: Source transformation, Thevenin's, Norton's and superposition theorems with applications in circuits having independent and dependent sources, maximum power transfer condition and reciprocity theorem. **Energy storage elements:** Inductors and capacitors, series parallel combination of inductors and capacitors. Responses of RL and RC circuits: Natural and step responses.**Magnetic quantities and variables**: Flux, permeability and reluctance, magnetic field strength, magnetic potential, flux density, magnetization curve. **Laws in magnetic circuits:** Ohm's law and Ampere's circuital law. Magnetic circuits: series, parallel and series-parallel circuits.**Sinusoidal functions**: Instantaneous current, voltage, power, effective current and voltage, average power, phasors and complex quantities, impedance, real and reactive power, power factor. **Analysis of single phase AC circuits**: Series and parallel LR, RC and

LRC circuits, nodal and mesh analysis, application of network theorems in AC circuits, circuits with non-sinusoidal excitations, transients in AC circuits, passive filters. Resonance in AC circuits: Series and parallel resonance.

Book Recommended:

1. Robert L. Boylestad, Introductory Circuit Analysis.
2. B. L., Theraja, Electrical Technology, Vol. I
3. Electrical Circuits, Richard C. Dorf

CSEL- 1107 Electrical Circuit Analysis Lab Marks:50 Credits:1.00

Laboratory classes are based on CSE-1105. Students will be introduced with basic electrical components such as capacitor, inductors and electronic devices such as diode, BJT, FET and their characteristics. They will implement different network theorems.

CSER-1108 English Marks :100 Credits :3.00

General discussion: Introduction, various approaches to learning English.**Grammatical Problems:** Construction of sentences, grammatical errors, sentence variety and style, conditionals, vocabulary and diction.**Reading Skill:**Developing readability, scan and skin reading, generating ideas through purposive reading.**Writing Skill:** Principles of effective writing; Organization, planning and development of writing; Composition, précis writing, amplification. **General strategies for the writing process:** Generating ideas, identifying audiences and purposes, construction arguments, stating problems, drafting and finalizing.**Approaches to Communication:**Business communication, and different types of business communication.**Listening Skill:**Strategies for developing listening skills.**Speaking Skill:** Practicing dialogue; Story telling; Effective oral presentation.**Report Writing:** Defining a report, classification of reports, structure of a report, and writing of reports.

Books Recommended:

1. Michael Swan, Practical English Usage.
2. Wren & Martin, Practical English Grammar.
3. Imhoof& Hudson, From Paragraph to Essay.
4. Thomas E. Berry, Common Mistake in English
5. Raymond & Murphy, Intermediate English Grammar.
6. Mosback&Mosback, Practical Faster Reading.
7. Chowdhury&Haqed. A Prose of our Time

CSER-1109: History of the liberation War of Bangladesh Marks: 100 Credits: 3.00

1st Year 2nd Semester(2nd Semester)

CSE-1201 Object Oriented Programming -I **Marks :100** **Credits:3.00**

Concepts of object oriented programming: objects, data and module encapsulation, polymorphism, static and dynamic binding, and inheritance. Object oriented programming with C++: classes, parameterized constructors, friend functions, multiple inheritance, passing object to functions, arrays of objects, pointer to objects, function and operator overloading, overloading constructor functions, references, inheritance, virtual functions and polymorphism, I/O class library, streams, creating insertors and extractors, formatting I/O, file 1/O, dynamic allocation using new and delete, static class members, the message based philosophy. Using C++memory model, using command line compiler, compiling multiple file programs. Standard Template Library. Exception handling.

The course teacher will assign a real life unique project to the individual student and student has to complete the project.

Books Recommended:

1. H. Shildt, C++ Complete Reference.
2. Schikt, Teach yourself C++
3. B. Stroustrap, The C++ Programming Language

CSE-1202 Object Oriented Programming –I Lab **Marks: 50Credits: 1.50**

Practical works based on CSE-1201

CSE-1203 Data Structures **Marks:100** **Credits:3.00**

Data Structures: Concept of data types, abstract data types. **Array:** Insertion, Deletion, Matrix representation of arrays, Multidimensional arrays, Pointers arrays, Record structures, Representation of records in memory; parallel arrays. Sparse matrices. Usefulness of sparse matrices. **Stack:** Push and Pop operations. Arithmetic expression: polish notation implementation using stack Queue: Insert and Delete operations. Double ended queue, Priority queue. **Recursion:** Direct and indirect recursion, Simulation of recursion, Depth of recursion, Removal of recursion. Towers of Hanoi using recursion. **Linked lists:** One way and two way linked lists. Traversing, Searching, Insertion and Deletion operations. Concept of algorithm analysis. **Sorting:** Bubble sort, Quick sort Merge sort, Selection sort, Inserting sort, Radix sort, Shell sort. Searching: Linear searching, Binary searching. **Binary Trees. Binary Search Trees:** Traversing (inorder, preorder, postorder). Insertion and deletion operations in Binary search trees. Threaded Binary Tree, Application of trees. Set representation, decision trees, game trees and counting binary trees. B-tree and basic operations on B-tree. Binomial tree and binomial heap, operation on binomial heaps. Fibonacci heaps and operations. Heap sort. Huffman codes and compression algorithm. Disjoint set and operations and disjoint set forests forests. Red black tree and operations. General trees.**Graphs:** Graph representation, Adjacency matrix, Path matrix, Linked representation. Shortest paths: Warshall 's algorithm. Operations on graphs: Insertion of an edge or a node. Deletion of an edge or a node. Traversing a graph: Breadth first, Depth first. Posets: Topological sorting. Spanning trees and connected component. Finding minimum cost spanning tree using Prim's algorithm. Critical paths, enumerating all paths. Symbol tables: Static and dynamic tree tables. **Hashing:** Hash function and overflow handling, Open hashing (Separate chaining) Close hashing (Open addressing), Linear probing, Quadratic probing, Double hashing. **Files:** File queries sequential organization. Indexing Technique: Cylinder + surface indexing, Hash indexes trees, Indexing-Btrees, Tree indexing.

Books Recommended:

1. Schaum's Outline Series, Data Structure
2. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft. Data Structures and Algorithms
3. Sahni, Computer Algorithm

4.Drozdek, Adam, Data Structure

CSEL-1204 Data Structures LabMarks:50 Credits: 1.00

Laboratory assignements will be based on Course CSE-1203. Students will be able to implement different data strcutures; like Array, String, Linked List, Tree, Graph in any programming language. They will be introduced with different sorting algorithms and advanced data structures.

CSE-1205 Basic Electronics Marks:100Credits:3.00

Introduction to Semiconductors: Semiconductors and their properties, Bonds in semiconductor, Classification- Intrinsic and extrinsic semiconductors. **Semiconductor Diodes and Special Purpose Diodes:** The pn junction- formation, properties and V-I characteristics, Basic constructions, characteristics, operations and uses of special diodes: Light-emitting diode (LED), Photo diode, Tunnel diode, Varactor diode, Shockley diode, Zener diode. **Bipolar Junction Transistors:**npn and pnp transistors, Amplifying and switching actions of transistor, Transistor characteristics in CB, CE & CC configurations, Operating point, Transistor load line analysis. **BJT Biasing:** Faithful amplification, Inherent variation of transistor parameters and thermal runway, Stabilization and stability factor, Methods of BJT biasing, Analysis and design of biasing circuits. **Single Stage Transistor Amplifier:** Single stage amplifier circuit, Phase reversal, dc and ac equivalent circuits, Load line analysis, Voltage gain and power gain, Classification of amplifiers, Amplifier equivalent circuits. **Field Effect Transistors:** Classification of FET , Construction, operation and characteristics of JFET, Transfer characteristics and Shockley's equation, Operation and characteristics curves of MOSFET, DC biasing of JFET. **Power Electronics:** Operations, characteristics and applications of industrial electronics devices: SCR (Silicon Controlled Rectifier), TRIAC, DIAC, UJT (Unijunction Transistor) **Feedback Techniques and Op-amps:** Concepts- negative and positive feedback, characteristics and gain with negative voltage and current feedback**,** Emitter Follower, Basic Op-amps- characteristics, inverting, non-inverting, integrators, differentiators, summing amplifiers. **Regulated Power Supply:** Voltage regulation, Rectifiers – operation and efficiency, half-wave and full-wave rectifiers, Ripple factor, Filter circuits – capacitor input filter, LC filter and □ -filter, Voltage regulator circuits- zener diode and transistor voltage regulator.**Oscillators:** Theory of oscillation, Tuned collector oscillator, Wien Bridge oscillator, Colpitt's oscillator, Hartley oscillator, Phase shift oscillator, Quartz crystal oscillator.

Books Recommended:

1. Boylestad and Nashelsky, Electronic Devices and Circuit Theory.
2. A.P. Malvino, Principles of Electronics
3. B.L. Theraja, BasicElectronicsSolidState
4. Millman&Halkias, Integrated Electronics
5. V. K. Mehta, Principles of Electronics
6. R.L. Gayakwad, Op-amps and Linear Integrated Circuit.
7. David A. Belf, Electronic Devices and Circuit.

CSEL-1206Electronics Lab Marks:50 Credits:1.00

Laboratory classes are based on CSE-1205. The students will gain knowledge about single stage amplifier, regulated power supply etc. Several experiments will be performed with the operation amplifiers. The students will be introduced with differentiator, integrator, comparator etc. The students will construct and test the different passive and active filter circuits.

CSER-1207Mathematics-II (Linear Algebra)Marks:100 Credits:3.00

Vectors in R^n and C^n. Review of geometrie vectors on R^2 and R^3 space, vectors in R^n and C^n. Inner product,norm and distance of vectors in R^n and C^n.**Matrices and Determinants:** Notion of matrix,types of matrices,matrix operation of matrix,algebra,determinant function. Properties of determinants. Minors, cofactors, expansion and evaluation of determiants,elementary row and column operation and row-reduces echelon matrices,invertible matriees,block matrices.**System of Linear Equations:** Linear equations,system of linear esquations (homogeneous and non-homogeneous) and Gaussian elimination method for solving system of linear equations.**Vector Spaces:**Notions of groups and fields.abstract vector space, subspace,sum and direct sum of sub spaces,linear independence of vectors, basis and dimension of a vector spaces,row and column space of a matrix, rank of matrices,solution spaces of systems of linear equations.**Linear Transfomations:** Linear transformation,kernel and image of a linear transformation and their propertics,matrix representation of linear tresformations,change of bases.**Eigenvalues and Eigenvectors :** Eigenvalues and eigenvectors, diagonalization,CayleyHamuilton theorem,applecation of Cayley Hamilton theorem.

Books Recommended:

1. Linear Algebra with Applications- Howard Anton.
2. Linear Algebra-Gilbert Story.

CSER-1208 Discrete Mathematics Marks:100Credits:3.00

Methods of proof: Mathematical Induction. **Counting:** functions and counting, pigeonhole principle, permutations and combinations, generalized permutations and combinations, inclusion-exclusion principle. **Propositional and Predicate Calculus:** Statements and Compound statements,tautologies and contradictions, logical equivalence, algebra of propositions conditionals, arguments and theory of inference of prepositional calculus, predicates: variables and quantifiers predicate formulas,theory of inference for the predicate calculus. **Theory of Sets:** Basic concepts sets and elements, venn diagram and membership table, set operations, algebra of sets duality classes of sets, power set. Introduction to Principles of mathematical induction. **Functions:** Basic concept, one-to-one and onto functions. **Relations:** Basic concepts, resentation of relations, types of relations, properties of relations, partial orderrings and equvalance relation. **Recurrence Relation:** Solving recurrence relation, generating functions. **Number Theory:** Division Algorithms-GCD, LCM,prime numbers and prime factorization, modular arithmatic and congruance, modular exponentiation, Eucledianalgorithm.introduction to groups, rings and fields. **Graph:** Basic definitions and different types of graphs, Representation of Graphs, Isomorphism, Conectivity, Planner Graphs, Eulers Formula, Kuratowski's Theorem, Eulerian and Hamiltonian Graphs, Graph Coloring techniques and applications. **Tree:** Properties of Tree, rooted trees, tree traversal, spanning tree.

Books Recommended:

1.Kennath A. Rosen, Discrete Mathematics

2. Schaum's Outline Series, Discrete Mathematics

3. Susamna, Discrete Mathematics with applications

CSER-1209:EconomicsMarks: 50 Credits: 2.00

Introduction: Definition, Microeconomics vs. macroeconomics, scope of economics, meaning of economic theory, some basic concepts- product, commodity, want, need utility, consumption, factors of production. **Demand:** Law of demand, factors determining demand, shifts in demand, demand functions, deriving demand curves, substitution and income effects, deriving aggregate demands, various concepts of demand elasticity and measurements, discussion on the method of estimating demand functions and demand forecasting. **Supply:** Law of supply and supply function, determination of supply, shifts in supply, elasticity of supply, market equilibrium. **Economic Theory of Consumer Behavior:** reasons for consumption, Principle of diminishing marginal utility, indifference curves, budget constraint, utility maximization and consumer equilibrium. **Consumer Demand:** change in budget constraints, price consumption curve, income consumption curve, consumer demand, market demand, Engel curve. **Production:** Production functions, total, average and marginal products, law of diminishing marginal products, production isoquants, marginal rate of technical substitution (MRTS), optimal combination of inputs, expansion path, returns to scale, estimation of production function and estimation of cost function. **Cost:** concepts of cost, fixed cost, variable cost, total cost, marginal cost, average cost, relation between average cost and marginal cost. short-run costs, relation between short-run costs and production, long run costs, economies and diseconomies of scale, relation between short run and long run costs, cost function and estimation of cost function. **Markets and Revenue:** Meaning of market, different forms of market, concepts of total, average and marginal revenue, relation between average revenue and marginal revenue curves, relation between different revenues and elasticity's of demand, equilibrium of the firm. **Price and Output:** Price and output determination under perfect competition, monopoly, monopolistic competition and oligopoly, profit maximization, price discrimination, plant shut down decision, barriers to entry.

Books Recommended:

1. P. A Samuelson, Economics.
2. John Sloman, Economics.
3. Koutsoyannis, Modern Microeconomics.
4. R.G. Lipsy, An Introduction to Positive Economics.
5. Stainlake and Grant, Introductory Economics.
6. N. Gregory Mankin, Principles of Economics

CSEV-1210 Viva-Voce Marks :50Credits: 1.00

All the major courses of 1st& 2nd semesters

2nd Year 1st Semester(3rd Semester)

CSE-2101 Object Oriented Programming –II Marks:100 Credits:3.00

An Introduction to Java, The Java programming environment, JDK overview, Memory management in java, **Fundamental programming structures in java:** primitive data types, control structure, methods, method abstraction and arrays, **Objects and Classes:** Fields, methods, and constructors, Access control, initialization and clean up, garbage collection, **Inheritance:** extending classes, subclass, super class, inheritance hierarchy, Overriding methods, dynamic method binding, abstract class, final method, final class, Packages, Interfaces & Inner classes, Java Collection Classes, **Exception and exception handling:** Exception handling fundamentals, Exception types, chained exception, creating own exception subclasses. **I/O:** I/O stream hierarchy, binary streams and character streams, **Graphical User Interface and Event Driven Programming:** Introduction to Swing and AWT, Component and Container and Layout, **Multithreading:** Thread basics, Creating a thread, Thread priorities, synchronization, Interthread communication, suspending, resuming and stopping threads, string class, Run time type identification, **Java applets:** interaction between the Web browser and applets, and conversion between applications and applets, Basics of JDBC and Socket Programming Java performance & Debugging in java. **Object-oriented Design Principles and examples:** Introduction to object-oriented design Principles and examples, Introduction to object-oriented design, UML.

CSEL-2102 Object Oriented Programming –II Lab Marks:50 Credits:1.50

Laboratory assignements will be based on Course CSE-2102. Students will be introduced with Object Oriented Programming in JAVA. They will be introduced with different advanced techniques of JAVA, like swing, socket programming, windows programming etc.

CSE-2103 Digital Logic Design Marks:100 Credits:3.00

Boolean Algebra and Minimization: Boolean constants and variables, truth tables. Basic logic functions. Boolean expressions. Implementing circuit from Boolean expressions. Boolean theorem's, DeMorgan's theorem. Sum-of-Product and Product-of-Sum forms. Simplifying logic Circuits, the Karnaugh map method.**Logic Gates and Combinational Circuits:** Different types of logic gates. Circuit design using NAND or NOR gates only. Alternative logic gate representations. Designing combinational logic circuits. Exclusive OR and Exclusive NOR circuits. **Flip-Flops:** SR, JK, D and T flip-flops. The D latch. Master-slave FF. Flip-flop applications. FF synchronization. Data storage and transfer. Frequency division and counting.**Arithmetic circuits:** Adder circuits. Carry propagation, carry look-ahead adder. IC parallel adder. The 2's Complement addition and subtraction circuit. BCD adder, Binary multiplier. **Counter and Register:** Asynchronous counters: Ripple counters, counter with mod numbers<2n , IC asynchronous counters, asynchronous down counter, propagation delay in ripple counters, synchronous down and up/down counters. Decoding a counter. Cascading BCD counters. Shift-register. Counter applications: frequency counter, digital clock. **MSI Logic Circuits:** Decoders, BCD to Decimal Decoders, BCD to 7-Segment decoders/drivers. Encoders. Multiplexer and multiplexer applications. DeMultiplexer and Demultiplexer applications. **Integrated-Circuit Logic Families:** Digital IC terminologies, TTL logic family, TTL series characteristics, open-collector TTL, tristate TTL, ECL family, MOS digital ICs, MOSFET, CMOS characteristics, CMOS tristate logic.**Memory Devices:** Memory technology, general memory operation, semiconductor memory technologies, different types of ROMs, semiconductor RAMs, static and Dynamic RAMs.

Books Recommended:

1. T.J. Tocci, Principle of Digital Electronics.
2. R.P. Jain, Modern Digital Electronics.
3. Morris Mano, Digital Electronics.

CSEL-2104Digital Logic Design LabMarks:50 Credits:1.00

Laboratory assignments ranges from investigation of the properties of basic logic gates and flip-flops to the design of combinational and sequential circuits based on CSE-2103. Students experience the designing, implementation, testing and troubleshooting of digital/logic circuits using small and medium-scale integrated circuits devices.

CSER-2105Mathematics -III (Ordinary Differential Equation) Marks:100 Credits:3.00

Ordinary differential equations and their solutions : Classification of differential equations. Solutions. Implicit solutions. Singular solutions. Intitial value problems. Boundary value problems. Basic existence and uniqueness theorems (statement and illustration only). Direction fields. Phase line. **Solution of first order equations :** Separable equations and equations reducible to this form. Linear differential, equations, exactdifferential equations, Special integrating factors, Substitutions and transformations. **Modeiling with first order differential equations :** Constructions of differential equations as mathematical models (exponential growth and decay. beating and cooling , mixture of solutions, series circuit, logistic growth, chemical reaction, falling bodies). model solutions and interpretation of results. orthogonal trajectories. **Solutions of higher order linear differential equations :** Linear differential operators. Basic theory of linear differential equations. Solution space of homogeneous systems. Reduction of order. Homegeneous linear equations with constant coefficient. Non homogeneous equation. Method of undetermined coefficiential. Variation of parameters. Euler-cauchy differential equations.

Books Recommended:

1. DG Zik-Ordinary Differential Equations.
2. S.L. Ross-Ordinary Differential Equations.

CSER-2106 : Introduction to Statistics and Probability Marks:100 Credits:3.00

Statistics- definition and scope: definitions of statistics, population and sample, descriptive and inferential statistics, characteristics and functions of statistics, application of statistics.
Variables and Data: variables: quantitative variable (discrete and continuous variables) and qualitative (categorical) variable,scale of measurement, data, types of data, sources of statistical data: primary and secondary sources of data, construction of questionnaire and other field problems of data collection.
Processing and Presentation of Data: classification of data, frequency distribution of qualitative and quantitative data, graphical display of qualitative data: bar diagram, pie charts, graphical display of quantitative data: histograms, stem-and-leaf plots, frequency polygons, frequency curves and ogive, identifying distribution shapes.
Descriptive Measures: measures of center: arithmetic mean, geometric mean, harmonic mean, median and mode. Quartiles and percentiles, trimmed means, measures of variation: range, inter-quartile range, variance and standard deviation, coefficient of variation, measures of skewness and kurtosis, exploratory data analysis: five-number summary and box and whiskers plot.
Relationships between Numerical Variables and Strength of Relationship:scatter diagram, simple correlation and rank correlation, simple linear regression analysis, estimation

of simple linear regression line by least squares criterion, ideas of polynomial regression, 3-variable regression. .

Basic Concepts of Probability: Random Experiment, Sample Space, Events, Union and Intersection of Events, Different types of events, Definitions of probability - classical, axiomatic and empirical, Laws of probability, Conditional probability, Theorem of total probabilities, Bayes' theorem.

Random Variables and Expectations: Random variables, discrete and continuous random variables, probability mass function, probability density function, Distribution function, joint distribution, marginal and conditional distributions, mathematical expectation, Variance.

Basic Distributions: Basic concepts of Binomial, Poisson and geometric distributions, normal, uniform and exponential distributions.

Texts

1. Islam, M. N. (2011): *An Introduction to Statistics and Probability,* Mullick& Brothers, Dhaka.
2. Weiss N. A., (2012): *Introductory Statistics*, 9th *edition*, Pearson Education, Inc.
3. Sheldon M. Ross (2010): *Introduction to Probability Models*, 10th *edition*, Elsevier Book aid international, Sabre foundation.
4. Rahman M. S. (2016): *MoulicParisongkhayan*, 7th *edition*, KaziProkashoni, Dhaka.

CSE-2107 Data Communication **Marks:100 Credits:3.00**

Introduction: Communication model, data communication tasks, data communication network standards and organizations. Protocol architecture, communications between layers, peer to peer communication between remote layers, service access points, service primitives and communication between adjacent layers, encapsulation of PDUs, addition of headers on transmission; removal on reception, segmentation & reassembly by protocol layers, introduction to TCP/IP model and OSI models. Definition of a communications network, types of network, understanding of operation and examples of use-point-to-point connections, circuit-switched networks, message-switched networks, packet-switched networks. types of equipment-end systems, intermediate systems (IS), types of communication - client and server communication, broadcast, unicast and multicast modes, types of packet-switched network-wide area networks (WANs), Internet service providers (ISPs), local area networks (LANs). 2. Physical Layer: Signal: Analog and digital data transmission, spectrum and bandwidth, transmission impairments, data rate and channel capacity. Transmission Medium: Characteristics and applications of various types of guided medium. Wireless Transmission: Characteristics and applications of wireless transmission-terrestrial and satellite microwave, radio waves, propagation mechanism, free space propagation, land propagation, path loss, slow fading, fast fading, delay spread, inter symbol interference, VSAT. Digital transmission: Line coding techniques- NRZ, RZ, Manchester, and differential Manchester encoding, AMI, Block coding, analog to digital conversion based on PCM, delta modulation, etc. Analog transmission: ASK, FSK, PSK, QPSK, QAM encodings, AM, PM, FM, etc. Data Transmission: Synchronous and asynchronous data transmission techniques, interfacing and V.24BIA-232-F, Multiplexing: FDM, international FDM carrier standards, synchronous TDM, international TDM carrier standards, statistical time division multiplexing. Spread Spectrum: Frequency hopping spread spectrum, direct sequence spread spectrum, code division multiple access. High speed digital access: DSL, SONET, SDH, etc. 3. Data Link Layer: Error Detection and Correction; parity check, CRC, forward error correction technique, linear block code, hamming code, etc. Data Link Control: Line configurations, flow control and error control techniques- sliding window, stop and wait ARQ, selective reject ARQ and HDLC protocols. Local Area Network: Topologies and transmission media, LAN protocol rchitecture, bridges, repeaters, hub, switches, routers, Ethernet, Token ring, Fiber channel, Introduction to wireless LAN. 4. Data Communication and Network: Circuit switching network, packet switching network, comparisonof circuit and packet switching, X.25 etc., Introduction to

telecommunication structure of public telephone system and its operation simplex, duplex, half-duplex, full-duplex communication, etc.

Books Recommended:

1. Haykin, Communication Systems.
2. Behrouz A. Forouzan, Data Communications and Networking
3. William Stallings, Data and Computer Communications.

CSE-2108 Data Communication Lab **Marks:50Credits:1.00**

Laboratory assignments ranges from investigation of the properties of basic communication errors, transfer and receive data based on CSE 2107. Students experience the designing, implementation, testing and troubleshooting of digital communication devices and equipments.

CSER-2109Financial and Managerial AccountingMarks:100Credits:3.00

Financial Accounting: Objectives and importance of accounting; Accounting as an information system; computerized system and applications in accounting; Recording system: double entry mechanism; Accounts and their classification; Accounting equation; Accounting cycle: journal, ledger, trial balance; Preparation of financial statements considering adjusting and closing entries; Accounting concepts (principles) and conventions. Financial statement analysis and interpretation: ratio analysis.**Cost and Management Accounting:** Cost concepts and classification; Overhead cost: meaning and classification; Distribution of overhead cost; Overhead recovery method/rate; Job order costing: preparation of job cost sheet and quotation price; Inventory valuation: absorption costing and marginal/variable costing technique; Cost-Volume-Profit analysis: meaning, breakeven analysis, contribution margin approach, sensitivity analysis. Short-term investment decisions: relevant and differential cost analysis. Long-term investment decisions: capital budgeting, various techniques of evaluation of capital investments.

Books Recommended:

1. Needles and Anderson: Principle of Accounting.
2. Weggandt and Kieso: Financial Accounting.
3. S.P. Jain and K.L. Narang: Advanced Accounting.
4. Md. Muinuddin Khan: Advanced Accounting.
5. Basu and Das: Advanced Accounting.

2nd Year 2ndSemester(4th Semester)

CSE-2201 Computer Architecture **Marks:100 Credits: 3.00**

Basic components of a computer and a microprocessor,types of components: registers, control section and ALU. **Digital Design Basics: Data representation**: Fixed and Floating point (IEEE754) number representations, **Arithmetic Circuits**: Adders, Subtractors& overflow, Magnitude Comparator, Other Basic Constructs: Decoder, Multiplexers etc. Flip-Flops and Latches, Register & Register Files, Sequential Circuits: Finite State Machine(FSM) representation, Serial Adder, Synchronous Counter Design, Timing Methodology. **Introduction to Processor Architecture:** The basic Accumulator based CPU: organization, instruction set, programming considerations, RISC & CISC Processors: Instruction Sets, Addressing Modes, Introduction to the Basic MIPS Instruction Set. **Performance Measurements** of processors. **Arithmetic Circuits:** Fast adders: Carry Look Ahead adders, Carry Save adder, Multipliers/Dividers: Booth's algorithm, restoring/non-restoring division, Array multipliers, Divider arrays. **Fixed Point ALUs**: Combinational and Sequential ALUs, ALU Expansion. **Floating Point Arithmetic & Floating point Units.Pipelined Processing:** Pipelined Multipliers, Carry Save Adders & Multipliers, Systolic Arrays. **Datapath& Control Design:** Single Cycle and Multi-cycle implementation of a Subset of the MIPS instruction set, the FSM control for datapath, Hardwired and Micro-programmed Control Design, Nanoprogrmming**Pipelined Datapath& Pipeline control**, Data and Control Hazards, Pipeline Performance. **Memory Organization:** Memory Devices, Random Access Memories, The Memory Hierarchy: Cost and Performance. **Cache Memory:** Associative & Direct mapping, Set associative Caches, performance measurements. **System Organization:** Buses, Bus arbitration, I/O Control, Interrupts and Direct Memory Access.

Books Recommended:

1. Stalling, Computer Organization and Architecture.
2. K. Hwang F.A. Briggs, Computer Architecture and Parallel Processing.
3. 3. J.P. Hayes, Computer Architecture and Organization

CSEL-2202 Computer Architecture Lab **Marks:50 Credits: 1.00**

Upon successful completion of this lab, students should have gained knowledge about different types of adder, subtractor, multiplier circuits (fixed and floating point), able to implement a 4 (or more)-bit arithmetic logic unit (ALU), control unit and finally can design and implement a 4-bit microprocessor and computer system.

CSE-2203 Database Management System **Marks:100 Credits :3.00**

Introduction: General overview and purpose of DBMS, advantages, applications, common features and overall structure of the database. **Relational Model:** structure of relational database, fundamental, additional and extended Relational Algebra operations, aggregate functions, outer joins and modification of the database using RA. **SQL** &**Advanced SQL:** Data definition, basic query structure, set operations, aggregate functions, null values, nested subqueries, complex queries, views, modification of the database, join relations, SQL data types and schemas, embedded and dynamic SQL, advanced SQL features. **Entity-Relationship Model:** Entity and relationship sets - attributes and keys, constraints in E-R model, E-R diagram, design issues, strong and weak entity sets, extended E-R features - specialization/generalization, reduction to relation schemas, database design in E-R model.**Relational Database Design:** Features of good relational design, functional dependency theory - basic concept, uses, closure of a set of FDs, closure of attribute sets, canonical cover, algorithms for FDs, decomposition using FDs & its desirable properties, atomic domains and first normal form, BCNF and 3NF, multivalued dependencies and fourth normal form, decomposition algorithms for different normal forms,

database design process. **Integrity** &**Security:** Integrity constraints, assertions & triggers, authorization in SQL, authorization & views, granting of privileges and authorization grant graph, encryption & authentication. **Storage and File Structure** Overview of physical storage media, magnetic disks, RAID, tertiary storage, storage access, file organization, organization of records in files, data dictionary storage. **Indexing and Hashing:** Basic concepts, ordered indices, B+-tree index files, B-tree index files, static & dynamic hashing, comparison of ordered indexing & hashing, index definition in SQL, multiple-key access. **Query Processing:** Overview, measures of query costs, selection operation, sorting, join operation, other operations, evaluation of expressions. **Query Optimization:** Introduction, transformation of relational expressions, evaluation plan, cost-based optimization, heuristic optimization, optimizing nested subqueries, materialized view & view maintenance.

Books Recommended:

1.Korth, Data Base Management system
2.Galgotia, Data Base Management system
3. Reb, Pata V., Data Base concept
4.Rerald V., Data Base Management system

CSEL-2204 Database Managment System Lab **Marks:50 Credits:1.00**

Database labs are based on theory course CSE-2203. One large or several small database applications will be developed in the lab. Student will be given the ER model or description of a real problem. Based on the description they will design the ER model or convert the ER model to relational model using the features of relational database design(such as functional dependency, normalization etc) and finalize the relational model. After finalizing the relational model, student will go for implementation. In the implementation phases they should design the sql statements, stored procedure, trigger, views etc. whatever is required to complete the implementation. In the implementation phase should also be the main concern about query optimization, transaction, recovery and backup.

CSER-2205Mathematics-IV(Complex Analysis, Fourier & Laplace Transform)

Marks:100 Credits:3.00

Complex Analysis, Complex numbers, properties, modulus &amplitudes of complex numbers. analytic functions, Cauchy - Riemann equations, Complex integration, Cauchy's Theorem, Cauchy's Residue theorem, Cauchy's integral formula, Higher order derivatives, Liouville's Theorem, Taylors and Laurent's theorems, singularities, Zero and poles of an analytic function, Residues, Evaluation & calculation of residues of real definite integral by contour integrations, Bilinear mappings, mappings, Conformal mapping.**Vector Analysis**: Limit, continuity and differentiability of scalar and vector point functions, Vector integration, line, surface and volume integrals, Gradient, Divergence and Curl of point function, Gauss's Theorem, Stocks Theorem and Green's Theorem.**Fourier series**: Fourier series, Process of determining the co-efficient, Fourier cosine and sine series, Fourier transform, Fourier sine and cosine transform.**Laplace transforms:** Basic definitions and properties, Existence theorem, Laplace transforms of periodic functions. Transforms of convolutions. InverseLaplacetransforms. Use of Laplace transforms in solving initial value problems.

Books Recommended:

1. R.V. Churchill, Complex Variable and Applications.
2. M.L.Khanna, Complex Variable.
3. A.K.M Shahidullah
4. Md. AbdurRahman, College Mathematical Methods.

CSER-2206 Numerical Analysis Marks:50 Credits:2.00

Solutions of equation in one variable: Bisection method,method of false position,fixed point iteration, Newton-Raphson method, error analysis iteration for iterative method, accelerating limit of conver-gence. **Interpolation and polynomial approximation :** Newton's forward, backward, interpolation formulas for equal intervals and Newton'sInterval formula and Lagrange's formula for unequal intervals.Taylor polynomial, interpolation and Lagrange polynomial. iterated interpolation. extrapolation. **Differentiation and Integration:** Numercial differentiation, Newton's forward, backward and inward formulas, Elements of Numericalinegrattion,adaptive quadrature method, Romberg's integration, Gaussian quadrature:Trapozaidal, Simpson's one-third, three-eights rules, Weddle's rule.

Books Recommended:

1. S.S. Sastry, Introduction methods of Numerical Analysis
2. Robert Dautory, Numerical Methods & Mathematical analysis
3. Richard L., Numeric Analysis
4. Sahaum's Outline Series, Numeric Analysis

CSER-2207: Numerical Analysis Lab Marks:50 Credits:1.00

Practical works based on CSE-2206 using FORTRAN and Mathematica/Mathlab

CSE-2208Design and Analysis of AlgorithmMarks:100 Credits:3.00

Introduction: The role of algorithms in computing. **Complexity Analysis:** Growth of a function, Asymptotic notation. **Recurrence Relation:** Methods to solve recurrences, Substitution method, Recursion tree method, Master method. **Graph related algorithms:** Breadth First search, Depth First Search, Topological sort, Strongly connected components, Euler Path, Articulation Point. **Shortest Path:**Dijkstra's shortest path algorithm, The Bellman-Ford algorithm for single source shortest path, The Floyd-Warshall algorithm for all-pair shortest path. **Divide and Conquer:** basic idea, properties, Applications of Divide and Conquer: Counting Inversions, Closest pair of points, etc. **Dynamic Programming:** Basic idea, Comparison with Divide and Conquer, Memorization. Application of Dynamic programming: Coin related problems, Longest Increasing Sequence (LIS), Longest Common Subsequence (LCS), 0/1 Knapsack problem, Matrix Chain Multiplication, etc. **Greedy method:** Elements of greedy method basic control structure, Comparison with dynamic programming and Divide and Conquer. Application of Greedy method: Minimum spanning tree: The algorithms of Prim &Kruskal, Job sequencing with deadline. **Backtracking:** Basic idea behind backtracking, control structure. Application of backtracking: Permutation & Combination Generation, Graph coloring problem, n-queens problems, Hamiltonian Cycle etc. Branch and Bound. **Network Flow:** Flow networks, The Ford-Fulkerson method, maximum bipartite matching, Maxflow-Mincut Theorem. Lower bound Theory for sorting**,** Exhaustive Search. **Number Theoretic Algorithms:** Extended Euclid's Theorem, Solving modular linear equations, The Chinese remainder theorem, The RSA public key encryption. **Computational Geometry related Algorithms:** Line segment intersection, Inclusion in a polygon, Finding Convex Hull: Grahams scan, Jervis's March. **String Matching Algorithms:** Naive string matching algorithm, String matching with finite automata, The Boyer-More algorithm for string matching, Knuth-Morris-Pratt algorithm. **NP-Completeness:** Polynomial time, Polynomial Time verification, NP-completeness and reducibility, NP-Completeness proofs, NP Complete problems. **Approximation Algorithms:** Introduction, Approximation Ratio, Approximation algorithms for: Vertex-Cover Problem, TSP Problem

Books Recommended:

1. Schaum's Outline Series, Data Structure

2. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft. Data Structures and Algorithms

3. Sahni, Computer Algorithm

4. Drozdek, Adam, Data Structure

CSEL-2209Design and Analysis of AlgorithmLab Marks:50 Credits:1.50

Based on course CSE-2209 student will be given various algorithmic problem based on different algorithm domains. By solving those problems students will gain knowledge on algorithmic techniques and their relative performances.

CSEV-2210 Viva-VoceMarks :50 Credits:1.00

All the major courses of 3rd& 4th semesters

3rd Year 1st Semester(5th Semester)

CSE-3101 : Finite language, Automata and Computation Marks:100 Credits:3.00

Finite Automata(FA): Deterministic FA (DFA) and Non-Deterministic (NFA), Equivalence and Conversion of NFA to DFA (the Subset Construction Algorithm). Regular Expressions, Identies for regular expressions, Conversion between regular expressions and NFA & DFA, FA with output: Mealy machines and Moore machines. Properties of Regular Languages: Pumping lemma & its application, Closure properties, Decision Algorithms, Minimization of DFAs. Grammars: The Chomsky hierarchy, Regular grammars and regular languages, Context Free Grammars (CFGs) and Languages (CFLs), Reduction of CFLs, Normal forms CNF and GNF. Push Down Automata (PDA), DPDAs, Equivalence of PDAs & CFLs. Properties of CFLs: pumping lemma, decision algorithms, CYK algorithm. Turing Machines, Computation with Turing Machines, Turing computable functions and partial and total recursive functions. Equivalence of Unrestricted Grammars and Turing Machines and Equivalence of Context sensitive grammars and Linear Bound Automata. Recursive and Recursively Enumerable languges and their properties, Undecidability – Diagonalization method, Halting problem, undecidable problems from language theory, Reducibility, Self reference and the Recursive theorem.

Books Recommended:

1. Hopcroft& Ullman, Introduction to Automata Theory, Languages and Computation
2. John Martin, Introduction to Language and Theory of Computation
3. M.Sipser, Introduction to Theory of Computation

CSE-3102 Mathematical Analysis for Computer ScienceMarks:100 Credits:3.00

Recurrent problems; Manipulation of sums; Number theory; Special numbers; generating functions. Random variables; Stochastic process; Markov chains: discrete parameter, continuous parameter, birth-death process; Queuing models: birth-death model, Markovian model, open and closed queuing network; Application of queuing models

Books Recommended:

1.Donald E Knuth,Concrete Mathematics
2. Roger Cook, Mathematical Analysis for CS
3.Waller Rudin, Principles of Mathematical Analysis

CSE-3103Operating SystemsMarks:100 Credits: 3.00

Introduction: Operating system overview, computer system structure, structure and components of an operating system. **System system calls:** class of system calls and description. **MIPS R3000 processor:** overview and programming model, Exceptions, MIPS system call, system161. **Process and threads:** process and thread model, process and thread creation and termination, user and kernel level thread, scheduling, scheduling algorithms, dispatcher, context switch, real time scheduling, OS/161 switch. **Concurrency and synchronization:** IPC and inter-thread communication, critical region, critical section problems and solutions. **Resource management:** introduction to deadlock, ostrich algorithm, deadlock detection and recovery, deadlock avoidance, deadlock prevention, starvation. **File management:** File Naming and structure, file access and attributes, system calls, file organization: OS and user perspective view of file, memory mapped file, file directories organization, **case study:** UNIX file access permissions and rights. **File System Implementation:** implementing file, allocation strategy, method of allocation, directory implementation, UNIX i-node, block management, quota. **UNIX file management:**

Berkeleyfast file system (FFS) Ext2fs, Ext3fs, superblocks, partition, Ext2fs and Ext3fs Directories, supporting multiple filesystem, OS/161 VFS, UNIX buffer cache, filesystem consistency. **Memory management:** basic memory management, fixed and dynamic partition, virtual memory, segmentation, paging and swapping, MMU. **Virtual memory management:** paging, page table structure, page replacement, TLB, R3000 TLB and address space, R3000 TLB handling, exception vector, demand paging and segmentation, thrashing and performance. **I/O management:** I/O Devices, I/O Bus architecture and controller, interrupts, DMA, programmed I/O, Evolution of I/O functions, I/O software layer, Device drivers, Device independent I/O software, buffering. **Disk I/O management:** structure, performance, low-level disk formating, Disk arm scheduling algorithm, error handling, stable storage. **Security:** threats, data security, intruders, data loss, user authentication, password security and salt, one way function, authentication using physical object, software threats, Trojan Horses, spoofing, trap doors, viruses, anti-virus approach and technique, snadbox implementation, security policy and mechanism, protection mechanism, protection domain, Access Matrix, access control list, capabilities. **RAID:** RAID 0-5, HP auto RAID. **Multiprocessor system:** UMA MP, NUMA, SMP- structure and programming model, synchronization, scheduling

Books Recommended:

1. Silberchatz,Galvin, Operating System Concepts
2. W. Stallings,Operating System Concepts
3. Tanenbaum ,Modern Operating system

CSEL-3104Operating Systems Lab **Marks:50 Credits:1.00**

Lab based on CSE-3105. Student will be asked to add operating system module such as memory management, system call, file system, drivers etc. In the lab for such modules problems will defined elaborately. The laboratory also train student in debugging.

CSE-3105 Microprocessor and Assembly Language **Marks:100** **Credits:3.00**

Introduction to Microprocessor: Evolution of Microprocessor, overview of microcomputer structure and operation, introduction to RISC and CISC processors. **8086 Microprocessor:** Introduction to 8086 microprocessor, 8086 architecture, registers and other components of 8086 system, 8086 instruction sets, constructing machine codes for 8086 instructions. 8086 system connections, timing and troubleshooting, 8086 interrupts and interrupt applications, Architecture of 8259A (priority interrupt controller), higher versions of 8086. **Pentium Microprocessor:** Introduction to Pentium Microprocessor, pentium processor architecture, Register sets, cache, floating point operations, addressing modes, addressing, paging, Pentium process instruction set, opcode, interrupt, programming in Pentium machine, Hardware details of Pentium, Protected mode operations, branch prediction. **Assembly Language Programming:** Writing programs for use with an assembler, assembly language program development tools, implementing standard program structures in x86 (8086, i386 and Pentium) assembly language, testing and debugging an assembly language program, processing string, macros and procedures, assembler directives.

Books Recommended:

1. D.V. Hall, Microprocessors and Interfacing.
2. M. Rafiquzzaman, Microprocessors and Microprocessor based Systems Design.
3. Barry B. Brey, The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro-Processor /architecture.
4. Lewis C. Eggebrech, Interfacing to the IBM Personal Computer.

CSEL-3106:Microprocessor and Assembly Language LabMarks:50 Credits:1.00

Laboratory classes are based on CSE-3107. Firstly, students will be introduced with Assembly Language and Assembler. Several experiments will be performed with the assemblers. They will work in the kit mode. They will be familiar with all the components of an 8086 system. By using toolkit they will be able to know the fundamentals of microcomputers from basic CPU instruction to practical applications. They will be able to control different types peripherals (LED, 7-segment display, Dot matrix display, etc) of the system by writing codes in machine language.

CSE-3107 :Computer NetworksMarks:100 Credits:3.00

Introduction to Computer Networks: Internet Architecture, Circuit and Packet Switching, Access Systems. Delay Calculation. Protocol Layers, **Application Layer**: Principles of Application Layers, HTTP, FTP, E-mail, DNS, SNMP, Socket Programming, P2P Networks. **Transport Layer**: Introduction to services, Multiplexing, UDP, Reliable data delivery, TCP, Congestion Control. **Network Layer**: Virtual Circuits, IP, Addressing, Router Internals, Routing Algorithms. **Data Link Layer**: Services, Error detection, Multiple Access Protocols, Link layer addressing, Ethernet, Switches, PPP. **Wireless and Mobile Networks:** Wireless characteristics, CDMA, Cellular Networks, Mobility. **Network Security:** Symmetric and Public Key Cryptography, Authentication, Digital Signatures, Key Distribution and certification, Firewalls.

Books Recommended:

1. J.F. Kurose, K.W. Ross - Computer Networking.
2. A.S. Tanenbaum, Computer Networks.
3. D Comer, Computer Networks.
4. L.L. Peterson, Computer Networks.

CSEL- 3108 Computer Networks LabMarks:50 Credits:1.00

Laboratory works Based on CSE-3203. Starting with application layer students will configure different application layer services and examine their messaging techniques. Students will be asked to develop some services based on tranport layer (TCP, UDP).

CSEP-3109 :Internet and web Programming (Project) Marks:50 Credits:1.00

Based on the following outline, student will be asked to develop a project

INTERNET STANDARDS: TCP and UDP protocols – URLs – MIME – CGI – Introduction to SGML. INTERNET PROGRAMMING WITH JAVA: Java basics – I/O streaming – files – Looking up Internet Address - Socket programming – client/server programs – E-mail client – SMTP - POP3 programs – web page retrieval – protocol handlers – content handlers - applets – image handling - Remote Method Invocation. INTRODUCTION TO WEB: History, web system architecture URL, Domain Name, System, overview of HTTP, HTTP request-response, generation of dynamic web pages, session, cookies. MARKUP LANGUAGE HTML: Introduction, Basic HTML, Formatting and Fonts, Commenting Code, Anchors, Backgrounds, Images, Hyperlinks,Lists,Tables,Frames,simple HTML Forms, XHTML. CASCADDING STYLE SHEET : The need for CSS, Introduction to CSS, Basic syntax and structure, using CSS, manipulating text, padding, lists, Positioning using CSS. INTRODUCTION TO PHP: Introduction, control structures, functions, arrays, objects, simple web applications . SERVER SIDE PROGRAMMING: Servlets – deployment of simple servlets – web server (Java web server / Tomcat / Web logic/Apache) – HTTP GET and POST requests – session tracking – cookies – JDBC – simple web applications – multi-tier applications. INTRODUCTION TO WEB EXTENSION: XML, Introduction XSL, XML transformed, XSL

elements transforming with XSLT, XML with CSS, web feeds (RSS), Introduction to web services.

Books Recommended:

1. Ralph Moseley, Middlesex University, Developing Web Applications,Wiley publication.
2. Marty Hall, Larry Brown, *Core Web Programming*, Prentice Hall
3.Craig D. Knuckles, David S. Yuen, Web Applications, Wiley publications.
4. Deitel&Deitel, *Internet & World Wide Web How to Program*, Prentice Hall
5. Steelman&Murach, *Java Servlets and JSP*, Murach& Associates Inc.

3rd year 2nd Semester (6th Semester)

CSE-3201: Compiler Design and Construction **Marks:100 Credits:3.00**

Phases of a compiler, front and back end of a compiler. **Lexical Analysis:** regular expressions and regular languages, Finite Automata based pattern matching, Input buffering techniques, **Syntax Analysis:** Context free grammars, Top-down parsing: LL(1), Recursive Descent parsing, Bottom-up parsing ; LR(0), SLR(1), LR (1), LALR(1) parsing, syntactic error recovery, **Syntax directed Definitions and Translation**, attributes evaluation, **Symbol Tables, Type expressions and type checking, Runtime structures**- Activation Records, Static and Dynamic Scoping. **Intermediate Representation:** Abstract syntax trees, 3-address code, etc. Generation of 3-address codes – Syntax directed translation for Declarations, Assignment statements, Boolean expression, switch/case statements, Flow of Control statements, etc. use of Backpatching. **Target Code generation**. **Optimization**: Control flow graphs, **Data flow Analysis**: Reaching definitions and Live-variable analysis and Def-use & use-def chains, Available Expression analysis and Global common sub expression elimination, Dominators, Loops in control flow graphs, Loop invariants and code motion, Elimination of Induction variables, Partial redundancy elimination, constant folding and constant propagation, copy propagation, Dealing with Alaiasing, Interprocedural Dataflow Analysis, Introduction to **Static Single-Assignment (SSA)form**; **Global Register allocation** by graph coloring, **Instruction Scheduling**: list scheduling, **Optimization for memory hierarchies**.

Books Recommended:

1.Aho,Alfred,V, Compiles: Principles, Techniques
2.John Wiley, Modern Compiler Design
3.H. Ball, Modern Compiler Design

CSEL-3202: Compiler Design and Construction Lab **Marks:50 Credits:1.00**

Laboratory assignments will be based on CSE-3201. Lab assignments will include but not limited to: design of simple lexical analyser, design of recursive descent parser, use of the compliler design tools e.g. LEX and YACC to implement different syntax directed translations and designing and implementing a complete compiler, for target machines such as x86 or MIPS like machines, for some given grammar of a simple but complete language. Simple optimizations techniques should be included.

CSE-3203: Digital Signal Processing **Marks:100 Credits :3.00**

Introduction to DSP, classifications of signals, continuous time and discrete time (DT) sinusoids, concept of frequency, advantages and limitations of DSP, applications of DSP, steps of ADC, sampling theorem, abasing, quantization, coding. Classification of DT signals, classification of DT systems, impulse response, FIR and IIR, block diagram of DT systems, analysis of LTI systems, convolution, properties of convolution, causality and stability of LTI systems, recursive and non-recursive systems, correlation, properties and applications of correlations. Z-transform, ROC, Inverse z-transform, properties of ztransform, concept of pole-zero, one-sided z-T. Frequency analysis, Fourier series and Fourier transforni for continuous time and discrete time signals, power density and energy density spectrums, DFT, properties of FT and DFT, invertibility of LTI systems, DFT as linear transformation, FFT, divide and conquer approach, radix-2 FFT. Structures of DT systems: Direct form, lattice structure, transposed structure. State-space system analysis. Digital filter: advantages and limitations of digital filters, adaptive filters, applications: inverse modeling, system identification, noise cancellation etc., characteristics of ideal and practical filters. Filter design: designing steps, window method, optimal method, IIR filter design methods.

Books Recommended:

1. E. Ifeachor& B.W Jervis, Digital Signal Processing.
2. R.G. Lyons, Understanding Digital Signal Processing.
3. T.J. Cavicchi, Digital Signal Processing.

CSEL-3204:Digital Signal Processing Lab Marks:50 Credits :1.00

Practical works based on CSE-4211

CSE-3205: Software Engineering Marks:100 Credits:3.00

The Product and the Process: the Product, the Process. **Managing Software Projects:** Project Management Concepts, Software Process and Project Metrics, Software Project Planning, Risk Analysis and Management, Project Scheduling and Tracking, Software Quality Assurance, Software Configuration Management. **Conventional Methods for Software Engineering**: System Engineering, Analysis Concepts and Principles, Analysis Modeling, Design Concepts and Principles, Architectural Design, User Interface Design, Component-Level Design, Software Testing Techniques, Software Testing Strategies, Technical Metrics for Software. **Object Oriented Software Engineering**: Object-Oriented Concepts and Principles, Object-Oriented Analysis, Object-Oriented Design, Object-Oriented Testing, Technical Metrics for Object-Oriented Systems. **Advanced Topics in Software Engineering**: Formal Methods, Cleanroom Software Engineering, Component-Based Software Engineering, Client/Server Software Engineering, Web Engineering, Reengineering, Computer-Aided Software Engineering.

Books Recommended:

1. RajaramanV.,Analysis& Design Information System
2. Awad, E,W, System Analysis & Design
3. Ali Behforooze and Frederick J. Hudson,Software Engineering Fundamentals
4. Ian Sommerville, Software Engineering

CSEL-3206: Software Engineering LabMarks:50 Credits:1.00

Based on CSE-3205, student will be asked to develope a project. To design such project student should first use CRC for determining the classes. After discussion and finalize student should develop UML class diagram for design. After finalize the design student will be asked to implement step by steps. Teacher have the flexibility to redesing the lab in other ways.

CSE-3207:Computer Peripherals and Interfacing Marks:100 Credits:3.00

INTERFACING: Interfacing basics: Peripheral devices, adapters, Data highway, I/O operations. Interrupts basics, types, priority etc. and the interrupt controllers- Daisy chain configuration, 8259A. DMA basics and the 8237 DMA controller. Buses: AGP, PCI and PCI express, USB, SCSI. Digital Interfacing: Digital Interfacing basics and the ProgrammableParallelPort 8255A. Centronics Standard for Parallel Printer Interfacing, Keyboard and Alpha-numeric Display Interfacing. Keyboard and Alpha-numeric Display Interfacing using 8279 .high power devices. Interfacing microcomputer ports to stepper motor and high power devices. Optical motor shaft encoders. Analog Interfacing: D/A (simple and R-2R ladder circuits) and A/D (parallel, successive approximation and Dual-slope circuits) converters, properties and interfacing, interfacing with different sensors. PERIPHERALS DEVICES: Different types of sensors and transducers. Input Devices: Different types of Mouse, Joystick, Scanner, Light, Pen, Touch Screen, OMR, OCR, Barcode Reader. Magnetic and Optical disk storage. Keyboard switches, Light Emitting Diodes, CRT and LCD displays, Laser printers: organization, working principle and properties.

Books Recommended:

1. Hall, Microprocessors and Interfacing.
2. M. Rafiquzzaman, Microprocessors and Microprocessor based Systems Design.
3.Barry B. Brey, The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro-Processor /architecture.
4. Lewis C. Eggebrech, Interfacing to the IBM Personal Computer.

CSEL-3208:Computer Peripherals and Interfacing LabMarks:50 Credits:1.00

The key objective of the course is to introduce the students with different peripheral devices (LED, 7-segment display, 16x2 LCD display, stepper motor, DC motor, survo motor, etc), Sensors (Temperature sensor, light sensors, etc) and interfacing. Besides that, students will be introduced how those devices are interfaced and controlled from computer. After completing the course, students will be able to control any peripheral devices from computer through computer's parallel port.

CSEP-3209 Application Design and Development (Project) Marks :50 Credits: 1.50

A project work should be done under the following framework:

Java 2 Enterprise Edition (J2EE): Introduction to Enterprise Edition, Java Servlet Technology, JSP Technology, Java Messaging Services (JMS), Enterprise Java Beans (EJB), Bean Managed Persistence, Java Persistence API(JPA),Session Bean, Spring, Hibernate, Struts, Java Server Faces(JSF), Web Services.

Android Application Development: Introduction of android platform, Android SDK Tools and Activity Class, ListActivity and ListView, Intents and Intent filters, Custom Views, Dialogs and Toasts, Options Menu, Context Menu, and WebView, Android Storage: SQLite and Content Providers, Application Complonent, Communication with web service, Fragment and Action bar, Location API and Google Maps-1, Location API and Google Maps-2, Android Notifications, Sensor and gesture, Deployment to Google Play.

C# and ASP.Net:MS.NET Framework Introduction,Developing Console Application, Working With Collections and Generics, Working with Components / Assemblies, WinForms, Data Access using ADO.NET, Data Access using ADO.NET – DataSet, Windows Services, Delegates & Events, ASP.NET Introduction,Validation Controls, Applying Themes and Styles to Controls, ASP.NET Architecture,Page Navigation Options,Creating a Layout Using Master Pages,User Control,ASP.NET State Management,DataboundControls,Creating Virtual Directory & Web Application,Globa.asax&HttpApplication,Understanding Configuration File - Web.Config,WebCaching,Authentication& Authorization, Globalization and Localization, AJAX.NET

CSEV-3210 Viva-VoceMarks :50 Credits: 1.00

All the major courses of 5th & 6th semesters

4th Year 1st Semester (7th Semester)

CSE-4101: Artificial IntelligenceMarks:100 Credits:3.00

Overview of Al, AI programming language: prolog, Environment Types, Agent Types, Agent Model, Reactive Agents, Perception: Neurons – Biological and Artificial, Perceptron Learning, Linear Separability, Multi-Layer Networks,Problem solving and searching: 8-puzzle problem, N-queen problem, robotic arm assembly, general search, Review of Un-Informed Search Strategies: bredth first search, uniform cost search, depth-first search, iterative deepening, bidirectional search; Informed search algorithms: best-first search, A* search, Beam search, Huristic searching, Memory Bounded Search (e.g. IDA*, RBFS, SMA*); Local Searches: Hill Climbing, Simulated Annealing, Constraint Satisfaction Problems. Genetic Algorithm. Motion planning: motion planning search, configuration, action and obstacle, Road map, Game Playing: motivation, minimax search, resource limits and heuristic evaluation, α-β pruning, stochastic games, partially observable games, continuous, embodied games, Neural Networks: Multi-Layer Neural Networks, Backpropagation, Variations on Backprop, Cross Entropy, Weight Decay, Momentum, Training Tips, Applications ALVINN, TD-Gammon, Machine Learning: Supervised Learning, Decision Trees, Reinforcement Learning, Exploration vs. Exploitation, Q-Learning, Temporal Difference learning, General concepts of knowledge, Knowledge representation, frame problem, representing time, events and actions, Utility and MEU, Value of Information, Decision Networks, Value Iteration algorithm, Partially Observable Markov Decision Process, Introduction to Game Theory. Logical Agent: Knowledge-based agents, Logic in general—models and entailment, Propositional (Boolean) logic, Equivalence, validity, satisfiability, Inference rules and theorem proving -- forward chaining, backward chaining, resolution, First order Logic: Universal and Existential Quantifiers, Keeping Track of Change, Inference in first order logic Planning, Situation Calculus, Belief Networks Probabilistic Reasoning, Hidden Markov Model and the Dynamic Bayesian Network. Logical Inference, Communication, Robotics

Books Recommended:

1. Peterson, Artificial Intelligence & Expert System
2. Russel, Artificial Intelligence
3. VasantHonovar, Artificial Intelligence & Neural Networks

CSEL-4102 :Artificial Intelligence LabMarks:50 Credits:1.00

Laboratory assignments will be based on the Course CSE-4101. Lab assignments includes, basic AI technologies and algorithms using non procedural programming languages, e.g., LIPS and/or PROLOG.

CSE-4103:Digital Image Processing Marks:100 Credits:3.00

Introduction: Definition, Origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System. **Digital Image Fundamentals:** Elements of Visual Perception, Structure of the Human Eye, Image Formation in the Eye, Brightness Adaptation and Discrimination , Light and the Electromagnetic Spectrum ,Image Sensing and Acquisition, Image Sampling and Quantization, Basic Concepts in Sampling and Quantization, Representing Digital Images, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations. **Image Enhancement in the Spatial Domain:** Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Smoothing Linear Filters, Order-Statistics Filters, Sharpening Spatial

Filters. **Image Enhancement in the Frequency Domain**: Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters, Homo-morphic Filtering.**Image Restoration**: Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only– Spatial Filtering, Periodic Noise Reduction, **Color Image Processing**: Color Fundamentals, Color Models, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation, Wavelets and Multiresolution Processing, Image Compression, **Morphological Image Processing**: Dilation and Erosion, Opening and Closing, The Hit-or-Miss Transformation, **Image Segmentation:** Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, Segmentation by Morphological Watersheds,, Representation and Description, Object Recognition

REFERENCE BOOK

- Digital Image Processing (2nd Edition); Author: Rafael C. Gonzalez, Richard E.

CSEL-4104:Digital Image Processing lab Marks:50 Credits:1.00

Practical works based on CSE-4103. Student should ask to use MATLAB.

CSE-4105 :Computer Graphics and AnimationMarks:100 Credits:3.00

Standard Graphics Primitives, Graphical User Interface; Graphics Hardware Display devices, Raster refresh graphics display, Use of frame buffer and look up table Coordinate convention Device coordinate and wild coordinate system. Vector graphics and raster graphics system. Scan conversiton algorithms: Mid-point Line, Circle and ellipes Creation Algorithms. Slope independent line drawing usiing mid-point line algorithm. Polygons: Difference type of polygons, polygon filling, triangulation, polygon filling algorithm. Windowing and Clipping: Window Viewpoint, Zooming, panning, line, text and polygon, clipping algorithms. Transformation: Homogeneous coordination, Transformation in 3D, Transformation matrices, translation, rotation, scaling. Projection: Parallel and perspective, standard projection matrices. Hidden Surface removal: Painter's algorithm, Z-Buffering, Visible surface ray-tracing algorithm. Illumination and Shading: Light Models, Ambient light, diffuse and specular reflection, light attenuations, Goraud and Phong shading, Recursive Ray Tracing. Monochorome and colored light: monochrome light, additive and suntractive light, Colored light- RGB, CMY, YIQ, HSV and HLS color model. Image File Format: PPM file, BMP file. Representing curves and surfaces: Polygonal surfaces, Parametric Cubic Curves- Hermite, Bezier and B-spline curces, parametric bi-cubic surfaces: bicubic splines. Introduction to Graphics Programming. The nature of computer animation.

REFERENCE BOOK

1.Foley,Computer Graphics
2. Steven , Roger, Advance Graphics Theory
3. A.K. Peters, Fundamentals of Computer Graphics
4. PrabhatAndleigh and KiranThakrar, Multimedia Systems Design.
5. Ralf Steinmetz, Multimedia Systems.
6. S. V. Raghavan, Satish K. Tripathi, Networked Multimedia Systems.

CSEL-4106 :Computer Graphics and Animation Lab Marks:50 Credits:1.00

Laboratory problems are designed based on CSE-4105 computer graphics course. The main target of this lab is to make the students familier with the underlying phenomenon of graphical rendering, which will help them to be a good graphics engineer. For rendering is done using the basic concept of polygon filling, z-buffering, shading and scan conversion algorithm. Help from any API is taken for rendering and animation.

CSE-4107: Data Mining and Data WarehousingMarks:100 Credits: 3.00

Introduction to machine learning and data mining, Designing a learning system, perspective issues in machine learning, Concept of learning and the general to specific Ordering: induction learning hypothesis, Find-S, version space and candidate elimination algorithms, List-then-elimination algorithms, A biased hypothesis space, unbiased hypothesis space, decision tree, Artificial Neural networks, Multilayer networks and back propagation algorithms, Recurrent network, Evaluation hypothesis, Bayesian learning, Naive bays classifier, Gibbs algorithms, Bayesian belief Networks, EM algorithms, Computational learning theory, probability learning theory, sample complexity finite hypothesis space, sample complexity infinite hypothesis space, Mistake bound model of learning, Instance based learning, K-nearest neighbor learning, Genetic algorithms, Learning sets rules, Analytical learning, Combining inductive and Analytical learning, Reinforcement learning, SVM, Boasting, Clustering, training and testing, cross validation, prediction performance, Data mining tools.

CSEL-4108: Data Mining and Data Warehousing LabMarks:50 Credits:1.00

Based on CSE-4107

CSE-4109: cryptography and Information SecurityMarks:100 Credits:3.00

Overview, Symmetric Ciphers, Block Ciphers and the Data Encryption Standard, Mathematical Tools for Cryptography: Substitutions and Permutations, Modular Arithmetic, Euclid's Algorithm, Finite Fields, Polynomial Arithmetic, Discrete Logarithms. Classical Encryption Techniques, Conventional Symmetric Encryption Algorithms, Modem Symmetric Encryption Algorithms, Advanced Encryption Standard, Contemporary Symmetric Ciphers Confidentiality Using Symmetric Encryption Public, Key- Encryption, Hash Functions and Message Digests. Introduction to Number Theory, Public-Key Cryptography and RSA, Key Management; Other Pubic-Key Cryptosystems, Message Authentication and Hash Functions, Hash Algorithms, Digital Signatures, Certificates, User authentication: Digital Signature Standard (DSS and DSA), Security Handshake Pitfalls Protocols, Network. Security Practice, Authentication Application Electronic Mail Security, IP Security, Web Security, Electronic Commerce Security, System Security, Intruders, Malicious Software, Firewalls.

Books Recommneded:

1. W. Stallings, Cryptography and network security
2.MC Nab, Network Security Assessment.
3.Chuvakin, Peikari, Security Warrior
4.Lockhart, Network Security Hacks.
5. CharisBrenton. Mastering Network Security
6. John E. Canavan, The Fundamentals of Network Security.

CSE-4110: cryptography and Information Security LabMarks:50 Credits:1.00

Based on CSE-4109

4th Year 2nd Semester(8th Semester)

CSEP/T-4201: Project/Thesis: **Marks: 200 Credits: 6.00**

Students have to complete a Project/Thesis work which will be assigned by the department based on their previous academic records .The work will be carried individually or by a group of normally two students under the direct supervision of an experienced teacher of the department and will be completed within two semesters. Finally students have to face the project/thesis defense.

CSE- 42 Option- I, Option- II and Option- III**
CSEL-42* Option- I Lab, Option- II Lab and Option- III Lab**

CSE-4203 :Simulation & Modeling Marks:100 Credits :3.00

Systems- System environment and System components; *System models and Simulation* - types of System model and simulation - Discrete and Continues, Static and Dynamic, Deterministic and Stochastic; Steps in a simulation study, Advantages and Disadvantages. *Discrete Event driven simulation* - Components and Organization, Event Scheduling/ Time Advance approach and Process Interaction approach, Event lists and List processing. Case study of simulations of simple systems; Basics of Parallel and Distributed Simulation. *Simulation Languages and Packages* - Process approach to simulation, application oriented and general purpose simulation language and software GPSS, SSF API for JAVA and C++, Arena, Extend, SIMUL8 etc. Probability and Statistical concepts in simulation - *Random variable and its probability distributions:* Bernoulli, Binomial, Poisson, Exponential, Erlang, Gamma and Normal distributions. *Stochastic process* - e.g. Poisson process, Non stationary Poisson process, Compound Poisson process and their properties. *Basics of Estimation, Hypothesis tests:* Confidence Intervals and t-distribution. *Queuing Models* - Queuing Systems, Queuing behavior (e.g. balk, renege and jockey) and Queuing disciplines, Arrival process, Inter-arrival time distributions and Service time distributions. Long run measures of performance, Little's formula, Analysis of different Single-server and Multi-Server queuing systems, *Queuing networks and their analysis,* Jackson's theorem. Inverse transformation technique for *generating random variates,* other techniques: Acceptance -Rejection, Special properties, Convolution etc. Random Number generation: Linear Congruent method, composite generators, Random number streams; Testing for random numbers - frequency test and test for autocorrelation. Input modeling: identifying input model with data - Histograms, Q-Q plots, selecting the family of distribution, parameter estimation and Goodness-of-fit tests; selecting input model without data, multivariate and time-series input models, Models of arrival processes. Verification and Validation of simulation models - face validity, validation of model assumptions, input-out transformation and input output validation using historical input data. Output data analysis - types of simulation with respect to output analysis, Stochastic nature of output data, measure of performance and their estimators, output analysis for terminating the simulation and for steady state simulations. Introduction to the techniques for comparison of alternative system design through simulation. Simulation and queuing models of computer systems: CPU, memory simulation; Traffic modeling and simulation of computer networks and network protocols, using queuing network analysis; Introduction to network simulators: SSFNet, ns2, GloMoSim etc.

Books Recommended

1.G. Gordon, System Simulation
2.N. Deo ,System Simulation with Digital Computer
3. Averil M., simulation &Mideling

CSEL-4204 Simulation & Modeling Lab Marks:50 Credits :1.00

Practical works based on CSE-4203

CSE- 4205: Distributed SystemsMarks:100 Credits :3.00

Introduction to Parallel and Distributed Systems: Architecture, Challenges, principle and paradigm, Middleware: Introduction to Erlang, Communication: synchronous and asynchronous communication abstraction and model, message passing and shared memory. Replication & Consistency: Control replication, data replication, consistency model and protocols. Distributed Shared Memory: Design issue, Implementation issue, consistency issue, Shared Memory model, MPI, LINDA, ORCA, case study: TradMark, JACKAL. Distributed Objects: introduction, remote objects, CORBA, Distributed Shared object, Globe. Synchronization & Coordination: Distributed algorithms, time and clocks, Local state, Global State, consistency protocols, coordination elections, distributed transactions management. Fault Tolerance: Failure model, Faults, Process Resilience, reliable communication, Recovery, checkpoints and checkpoint algorithms, Rollback recovery algorithms, Security: Threats and attacks, policy and mechanism, Design issue, design of cryptographic algorithms, cryptographic protocols, key distribution, authentication, secure communication, auditing. Naming: Basic concept, Naming Services, DNS, Attribute based naming, X.500 and LDAP, Distributed File Systems: Client perspective, Server perspective, NFS, Coda, Google File System(GFS). Parallel Programming: parallel computing, parallel programming structure, PlanetLab, Grid: Grid model, Grid Middleware, Globus toolkit, PlanelLab Overview.

Books Recommended:

1. Coulouris, George, Distributed System : Concept & Design
2. Tannenbaum, Distributed System
3. Birman, Reliable Distributed System

CSEL-4206 :Distributed Systems Lab Marks:50 Credits :1.00

Practical works based on CSE-4205

CSE-4207: Network Routing and Switching Marks:100 Credits :3.00

IP addressing: IPv4 Addressing, IPv6 addressing, packet format, ICMPv6, Unicast Routing (IPv4 and IPv6): RIP, OSPF, BGP. Multicast Routing (IPv4 and IPv6): DVMRP, MOSPF, CBT, MBONE, PIM etc Switching/Advanced Routing: ATM, Optical Routing, MPLS, NEMO. Routing for MANET / Ad-hoc Network: AODV, DVMRP etcQoS Routing: QoS Network, Packet Scheduling, TCP/IP Queue Management, QoSIntServ: Admission control, Signaling Protocol(RSVP), Traffic Policing etc. QoSDiffServ: Policy based routing, Bandwidth Broker etc, QoS in Wireless network, Real Time Traffic over Internet: VoIP, RTP, RTCP, Security Issues in routing.

Books Recommended:

1.Fouzen , Data Communication & Networking
2.Willian Stallings, Data Communication & Networking
3.Martin J., Routing & Switching
4. Jeff Doyle, Routing with TCP/IP

CSEL-4208: Network Routing and Switching Lab Marks:50 Credits :1.00

Practical works based on CSE-4207

CSE-4209: System Programming Marks:100 Credits :3.00

Systems programming concepts, general machine structures, machine and assembly language, concepts of translation oriented system programs; **Assembler, Linker & Loaders:** Basic Assembler Functions, Machine Dependent Assembler features, Machine Independent Assembler Features, Assembler Design Options - One pass assembler and multipass assembler, Basic Loader Functions, Machine Dependent Loader Features, Machine Independent Loader Features, Linkage Editors, Dynamic Linking, Bootstrap Loader, Basic Macro Processor Functions. **Kernel:** General kernel responsibilities, kernel organization, kernel compiling and installing, kernel's role at system startup, process creation and termination, Process execution, ELF format, inter process communication, signal handling, Memory management: page frame management, memory area management, kernel memory management, VFS: VFS data structures, File system handling, Generic characteristics of Ext3 file system, **Interrupt:** Interrupt handlers, registering an interrupt handler, writing an interrupt handler. **System Calls:** system call handler, system call implementation, entering and exiting a system call. **Device Driver:** Building, installing and loading modules, I/O architecture, the device driver model, device files, character device driver, block device driver, working with USB device driver.

Books Recommended:

1. Robert Love, Linux System Programming
2. W. Richer, System Programming
3. Johnson M. Hart, Windows System Programming

CSEL-4210: System Programming LabMarks:50 Credits :1.00

Practical works based on CSE-4209

CSE-4211: Distributed Database System Marks:100 Credits :3.00

Introduction to Distributed database Systems, Distributed Database system architecture & design, Centralized system, Clint-Server systems, Parallel systems, Distributed systems, Network types, Distributed data storage, Network transparency, Data query processing, Data transaction model, Commit protocols, Coordinator selection, Concurrency control, dead lock handling, Multidatabase system, Loaction of Database, Multiple copies of data, Distribute database and applications.

Books Recommended:

1. Chery, Distributed Database System
2. T. Tamer, Principles of Distributed Database System
3. Wesley W. Chu, Distributed Database System

CSEL-4212: Distributed Database System LabMarks:50 Credits :1.00

Practical works based on CSE-4217

CSE-4213: Neural Network & Fuzzy System Marks:100 Credits:3.00

Introduction to neural networks, Neural Dynamics, Activation functions and signals, activation models, Synaptic Dynamics, Unsupervised and supervised learning, Learning algorithms, Neural network architectures, Single layer Perceptions, Multilayer layer Perceptions, Back Propagation algorithm, XOR problems, Perception Convergence theorem, Support Vector machine, Neurodynamic Programming, Fuzzy system

Books Recommended:

1. Haykin, Neural Networks concept
2. Diamantaras K. Principle Component Neural Network Theory

3. Schalkoft, Rebert J., Artificial neural Networks

CSEL-4214: Neural Network & Fuzzy System Lab **Marks:50 Credits:1.00**

Practical works based on CSE-4213

CSE-4215: Digital System Design **Marks:100 Credits:3.00**

Designing I/O system; I/O devices; Designing Microprocessor based system with interfacing chips; Programmable peripheral interface (interface to A/D and D/A converter); Keyboard/display interface; Programmable timer; Programmable interrupt controller, DMA controller; Design using MSI and LSI components; Design of memory subsystem using SRAM and DRAM; Design of various components of a computer: ALU, memory and control unit â€“ hardwired and micro programmed; Microprocessor based designs; Computer BUS standards; Design special purpose controllers.

CSEL-4216:Digital System Design Lab **Marks:50 Credits:1.00**

Practical works based on CSE-4215

CSE – 4217: Digital Electronics and Pulse Techniques Marks:100 Credits:3.00

CSEL-4218: Digital Electronics and Pulse Techniques Lab Marks:50 Credits:1.00.

Laboratory works based on **CSE-4217**

CSE-4219: Digital Forensics and InvestigationMarks:100 Credits:3.00

Digital Forensics: An overview, Forensics basic and criminalities,Forensic modeling and principles. Understanding Computer Investigations, Basics of Operating system: A review, Data Acquisition File carving and testing, Cyber forensics tools and testing, processing crime and incident scenes, Recovering Graphics Files, Computer Forensics Analysis and validation, Cell Phone and mobile device forensics, Virtual Machine, Network forensics and Live acquisition, network attach trace back and attribution, E-mail Investigation multicast finger printing, multimedia forensics, Intrusion and online frauds detection; Court testimony and report writing skills; Digital Evidence control.
Cyber Law: National ICT Act, National ICT Policy, National e-services rules, National Information security policy guideline, National Copyright, patent, trademark related laws, Laws on document & records retention, UN conventions/Laws related to internet or cyber security, Rights to know, Freedom of Information.

CSEL-4220: Digital Forensics and Investigation LabMarks:50 Credits:1.00

Based on **CSE-4219**

CSE-4221: Natural Language Processing Marks:100 Credits:3.00

Words, Parts of Speech, Syntax, Grammars, Semantics,Language Modeling in General and the Noisy Channel Model.**,** Linguistics: Phonology and Morphology Word Classes and Lexicography. Mutual Information. The t-score. The Chi-square test. Hidden Markov Models (HMMs). The Trellis & the Viterbi Algorithms.HMM Tagging (Supervised, Unsupervised). Evaluation methodology (examples from tagging). Precision, Recall, Accuracy. Statistical Transformation Rule-Based Tagging.Maximum Entropy Tagging.Feature Based Tagging. Results on Tagging Various Natural Languages.Non-statistical Parsing Algorithms (An Overview). Simple top-down parser with backtracking.Probabilistic Parsing. Introduction.Statistical Machine Translation (MT).

CSEL-4222: Natural Language Processinglab Marks:50 Credits:1.00
Based on **CSE-4221**

CSE-4223: System Analysis and Design Marks: 100 Credits:3.00

Introduction to general systems theory, Players in the Systems Game, Information Systems Building Blocks. Information Systems Development, Project Management. Systems Analysis, Requirements Discovery, Deliverables, Data Modeling and Analysis, Process Modeling, Feasibility Analysis and System Proposal, Systems Design, Applications Architecture and Modeling, Database Design, Output Design and Prototyping, Input Design and Prototyping, User Interface Design, Systems Construction and Implementation, Systems Operations and Support, Object-Oriented Analysis and Modeling, Object-Oriented Design and Modeling.

CSEL-4224: System Analysis and Designlab Marks: 500 Credits: 1.00

Based on **CSE-4223**

CSE-4225:VLSI DesignMarks:100 Credits :3.00

Introduction to MOS technology: POMS, NMOS and CMOS, transistors, CMOS Fabrication **Design Approaches:** Fabrication steps, steps stick diagrams, design rules and layout, contact cuts, double metal MOS process rules. MOS circuits, **Delay Analysis**: Inverter delay and its analysis, delay of different sequential and combinational circuit. **Sequential System:**Susperbuffer, Dynamic MOS circuits, Scaling of MOS circuits. Scaling factors and device parameters. **Subsystem design and layout**. **Switch logic**: pass transistors and transmission gates. Gate logic: The inverter, Two input nMOS, CMOS and BiCMOS gate design. Design of parity generator and multiplexers. Registers, Counters and memory realizations, One transistor and three transistors dynamic RAM cell design. **Hierarcihcalveiw of VLSI System Design**: Behavioral description High level Synthesis Scheduling, allocation and data path synthesis. **Logic synthesis**: multilevel minimization, PLA reduction regular structure circuits, Synthesis of FSM-ASM chart representation and realization, Layout synthesis, Placement and routing, Testing of VLSI, Testing of stuck-at fault, Testing of PLAs RAM. **Introduction to Reversible Logic:** Theory of reversibility, Reversible gates, reversible circuits, reversible logic synthesis. **FPGA:** Introductio to FPGA and FPGA programming using VHDL.

Books Recommended:

1. Steven M. Rubin, Computer Aids for VLSI Design.
2. Wayne Wolf, Modern VLSI Design: System-on-Chip Design.
3. Sabib H Gerez, Algorithms for VLSI Design Automation

CSEL-4226:VLSI Design LabMarks:50 Credits :1.00

Practical works based on CSE-4225

CSE-4227: Pattern Recognition **Marks:100** **Credits:3.00**

Introduction to pattern recognition: Classification Statistical Methods, Structural Methods and Hybrid method. Introduction to passen grammar and languages. Applications to character recognition medical imaging area. feature detection, classification, Review of probability and some linear algebra. Bayesian Decision making, linear discriminants, reparability, multi-class discrimination; quadratic classifiers, Fisher discriminant, sufficient statistics, coping with missing or noisy features, Bayesian estimation; non-parametric estimation; Non-parametric classification, density estimation, Parzenestimation,training methods, maximum likelihood, Bayesian parameter estimation, MAP. Linear discriminant functions.. Template-based recognition, eigenvector analysis, feature extraction, Eigen vector analysis. Clustering, unsupervised learning, vector quantization, K-means and E/M, neural nets. Sequence analysis, HMMs. k-nearest-neighbor classification, Mixture modeling, Optimization by ExpectationMaximization, Hidden Markov models, Viterbi algorithm, Baum-Welch algorithm, Linear dynamical systems, Kalman filtering and smoothing, Bayesian networks, independence diagrams, Decision trees, Multi-layer Perceptrons.

Books Recommended:

1.Haykin, Neural Networks
2. Berger, Pattern Recognition
3. Sergious T., Pattern Recognition
4. William Gibson, Pattern Recognition & Neural Networks

CSE-4228: Pattern RecognitionLab Marks:50 Credits:1.00

Practical works based on CSE-4227

Diode logic gates, transistor switches, transistor gates, MOS gates, Logic Families: TTL, ECL, IIL and CMOS logic with operation details. Propagation delay, product and noise immunity. Open collector and High impedance gates. Electronic circuits for flip-flop, counters and register, memory system, PLAs and PLDs. A/D., D/A converters with applications. S/H circuits, LED, LCD and optically coupled oscillators. Non-linear applications of OP AMPs. Analog switches.

Linear wave shaping : diode wave shaping techniques, clipping and clamping circuits. Comparator circuits, switching circuits. Pulse transformers, pulse transmission. Pulse generator; monostable, bistable and astablemultivibrators; Schmitt trigger; Blocking oscillators and time-base circuit. Timing circuits. Simple voltage sweeps, linear current sweeps.

CSE-4229: Cloud Computing **Marks:100** **Credits:3.00**

Distributed systems, issues in distributed systems, need for cloud computing, Introduction to cloud computing, Applications, Trends, Software as a Service, Platform as a Service, Infrastructure as a Service, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Virtualization, Hypervisors, Dockers, Virtual Desktop Infrastructure and Desktop as a Service, Web Services and Cloud, Edge computing, Mobile Cloud Computing, Cloud Computing Application Deployments, Challenges in Cloud Computing, Future of Cloud Computing, Security issues in cloud computing.

CSE-4230: Cloud Computing Lab Marks: 50 Credits: 1.00

Problems based on Hypervisor and Virtual computers, Deployment of Containerized Applications, Cloud infrastructure and Hadoop frameworks, Cloud computing simulation.

CSE-4231: Network Programming **Marks:100** **Credits:3.00**

Introduction to Network Layer, Introduction to the Network Programming, IP Addresses: Classful& Classless Addressing, Delivery and Forwarding of IP Packets, Sockets Introduction and Protocol Setting, Internet Protocol Version 4(IPv4) Address, Socket Address Structure and Byte Ordering Functions, Transmission Control Protcol(TCP), Internet Address Conversion Functions, Transmission Control Protcol(TCP), TCP Server/Client, User Datagram Protocol(UDP), UDP Server/Client, Unix Networking Processes, Address Resolution Protcol (ARP), Advanced Socket Programming, Internet Control Message Protocol (ICMP), Inter-Process communication, Unicast Routing Protocols, Socket Options, Advanced I/O Functions Serialization I/O Multiplexing, Dynamic Host Configuration Protocol(DHCP), Multi-Thread Programming, Domain Name Service(DNS) , Software Defined Network (SDN), Network Function Virtualization (NFV).

CSE-4232: Network Programming Lab
Based on the Network Programming Course.

CSE-4233: Image and Video Quality Assurance
Multimedia has a great influence in today's daily life. We are dealing with Computer based image and video processing and transmission in our day-to-day activities. However, the quality of the media get distorted and create a certain amount of annoyance to the viewer's eye, as a result, developers and service providers need to asses and improve the quality. This course will deal with the basic understanding of the quality and various tools and techniques to assess and improve image and video quality for different applications.

Preliminaries, Image quality, image quality attributes, Subjective image quality assessment (IQA), issues in subjective assessment, objective image quality assessment, Full-reference, Reduced-Reference and No-Reference Image Quality Assessment methods. Psychological aspects in IQA, Visual Saliency detection and saliency-based IQA, Datasets for IQA, Machine-learning approaches for IQA, Quality assessment of Screen Content Images.
Video Quality Assessment (VQA), difficulties in assessing video quality, video quality parameters, ensuring quality while video encoding. Quality assessment for a video stabilization.Quality of 3D image and video.
Recent Advances in Image and Video Quality Assessment.

CSE-4234: Image and Video Quality Assurance
Based on the Image and Video Quality Assurance Course

CSEV-4235 Viva-Voce Marks:50 Credits: 1.00

All the courses of 7th& 8th semesters