Syllabus

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For

B.Sc. in Computer Science and Engineering
(8 Semesters)
Session: 2012-2013

Department of Computer Science & Engineering
Faculty of Science

Jagannath University
Dhaka-1100

Syllabus 2012-13
Department of Computer Science & Engineering
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The ever-increasing needs and application of computers in almost every walk of life need not be overemphasized. The situation in developing countries as compared to the developed ones is no different. Computers now-a-days are being widely used in all fields conceivable. To keep pace with this advancement in Computer Science and Engineering, it is essential that efforts are made both in the public and private sectors to develop human resources in this particular field.

Opportunities to pursue academic programs in Computer Science and Engineering are not rather limited in Bangladesh. The prime objective of establishing the Department of Computer Science and Engineering of this university is to make a concerned effort towards achieving the goal of providing quality education. Distinguished faculty members from home & abroad are working in this Department.

Courses leading to the Degree of Bachelor of Science in Computer Science & Engineering will extend over four academic years and will be divided into 8(Eight) semesters conforming to the University Rules and Regulations. The course of study shall be an integrated one carrying a total of **160 Credits (5000 Marks).** All the courses are compulsory for each student.

Number of each theoretical course will be divided as follows:

Particulars	**Marks(%)**
Final Examination	70%
Continuous Assessment	30%(Mid-term/ Class test(minimum two)carry 20% Marks, Class Attendance carry 10% marks.

Number of each Practical course will be divided as follows:

Particulars	**Marks(%)**
Final Examination	70%
Continuous Assessment	30%(Mid-term/ Practical Sheet/Lab Performance/ Presentations carry 20% Marks ,Class Attendance carry 10% marks.

Semester	Total Marks	Total Credits
1st Year 1st Semester	550	18.00
1st Year 2nd Semester	600	19.00
2nd Year 1st Semester	650	21.00
2nd Year 2nd Semester	650	21.00
3rd Year 1st Semester	600	19.00
3rd Year 2nd Semester	650	21.00
4th Year 1st Semester	650	21.00
4th Year 2nd Semester	650	20.00
Total	5000	160

Examinations of the theoretical courses will be 3(Three) Hours for 3 credits and 2 Hours duration for 2 Credits and duration of each practical examination will be 3(Three) Hours as per for each credit point as per the decision of the Academic Committee of the Department.

Evaluation:

Final Examination (Theory, 2 hours, 2 credits): 35 Marks. Seven questions will be set, of which five are to be answered.

Final Examination (Theory, 3 hours, 3 credits): 70 Marks. Eight questions will be set, of which five are to be answered.

Curriculum Plan
B.Sc. in Computer Science & Engineering

1st Year 1st Semester

Course Code	Course Title	Marks	Credits
CSE-1101	Computer Fundamentals	50	2.00
CSE-1103	Structured Programming Language	100	3.00
CSEL-1104	Structured Programming Language Lab	50	2.00
CSER-1105	Mathematics -l (Fundamentals of Mathematics, Differential Calculus & Co-ordinate Geometry)	100	3.00
CSER-1107	Physics (Heat and Thermodynamics, Structure of Matter, Waves and Oscillations, and Physical Optics)	100	3.00
CSERL-1108	Physics Lab	50	2.00
CSER-1109	English	100	3.00
	TOTAL	**500**	**18.00**

1st Year 2nd Semester

Course Code	Course Title	Marks	Credits
CSE-1201	Object Oriented Programming Language	100	3.00
CSEL-1202	Object Oriented Programming Language Lab	50	2.00
CSE-1203	Electrical Circuit Analysis	50	2.00
CSE-1205	Basic Electronics	50	2.00
CSEL-1206	Electrical & Electronics Lab	50	2.00
CSER-1207	Mathematics -ll (Integral Calculus, Ordinary and Partial Differential Equations)	100	3.00
CSER-1209	Discrete Mathematics	100	3.00
CSEV-1210	Viva-Voce	50	2.00
	TOTAL	**600**	**19.00**

2nd Year 1st Semester

Course Code	Course Title	Marks	Credits
CSE-2101	Data Structures	100	3.00
CSEL-2102	Data Structures Lab	50	2.00
CSE-2103	Digital Logic Design	100	3.00
CSEL-2104	Digital Logic Design Lab	50	2.00
CSER-2105	Mathematics- lll(Matrices, Vectors, and Fourier Analysis)	100	3.00
CSER-2107	Introduction to Statistics and Probability	100	3.00
CSER-2109	Economics	50	2.00
CSER-2111	Financial and Managerial Accounting	100	3.00
	TOTAL	**650**	**21.00**

2nd Year 2nd Semester

Course Code	Course Title	Marks	Credits
CSE-2201	Data and Telecommunication	100	3.00
CSE-2203	Database Management Systems	100	3.00
CSEL-2204	Database Management Systems Lab	50	2.00
CSER-2205	Mathematics-IV (Complex Variable, Laplace Transforms)	100	3.00
CSER-2207	Numerical Analysis	100	3.00
CSE-2209	Algorithms	100	3.00
CSEL-2210	Algorithms Lab	50	2.00
CSEV-2212	Viva-Voce	50	2.00
	TOTAL	**650**	**21.00**

3rd Year 1st Semester

Course Code	Course Title	Marks	Credits
CSE-3101	Theory of Computation	100	3.00
CSE-3103	Mathematical Analysis for Computer Science	100	3.00
CSE-3105	Operating Systems	100	3.00
CSEL-3106	Operating Systems Lab	50	2.00
CSE-3107	Microprocessor and Assembly Language	100	3.00
CSEL-3108	Microprocessor and Assembly Language Lab	50	2.00
CSE-3109	Computer Architecture	100	3.00
	TOTAL	**600**	**19.00**

3rd Year 2nd Semester

Course Code	Course Title	Marks	Credits
CSE-3201	Compiler Design and Construction	100	3.00
CSEL-3202	Compiler Design and Construction Lab	50	2.00
CSE-3203	Computer Networks	100	3.00
CSEL-3204	Computer Networks Lab	50	2.00
CSE-3205	Software Engineering and Information System Design	100	3.00
CSEL-3206	Software Engineering and Information System Design Lab	50	2.00
CSE-3207	Artificial Intelligence	100	3.00
CSEL-3208	Artificial Intelligence Lab	50	1.00
CSEV-3210	Viva-Voce	50	2.00
	TOTAL	**650**	**21.00**

4th Year 1st Semester

Course Code	Course Title	Marks	Credits
CSE-4101	Computer Peripheral and Interfacing	100	3.00
CSEL-4102	Computer Peripheral and Interfacing Lab	50	2.00
CSE-4103	Internet Programming	100	3.00
CSEL-4104	Internet Programming Lab	50	2.00
CSE-4105	Computer Graphics and Multimedia Systems	100	3.00
CSEL-4106	Computer Graphics and Multimedia Systems Lab	50	2.00
CSE-41**	Option-I	100	3.00
CSEP-4114	Project and Thesis	100	3.00
	TOTAL	**650**	**21.00**

Option –I

Course Code	Course Title	Marks	Credits
CSE-4107	Cryptography and Network Security	100	3.00
CSE-4109	Fiber Optic Communication	100	3.00
CSE-4111	Pattern Recognition	100	3.00
CSE-4113	Basic Graph Theory	100	3.00

4th Year 2nd Semester

Course Code	Course Title	Marks	Credits
CSE-4201	Design and Testing of VLSI Systems	100	3.00
CSEL-4202	Design and Testing of VLSI Systems Lab	50	2.00
CSE-4205	Wireless Mobile Communication	50	2.00
CSE-42**	Option- II A	100	3.00
CSEL-42**	Option- II A Lab	50	1.00
CSE-42**	Option- II B	100	3.00
CSEL-42**	Option- II B Lab	50	1.00
CSE-4222	Viva-Voce	50	2.00
CSEP-4224	Project and Thesis	100	3.00
	TOTAL	**650**	**20.00**

Option –II

Course Code	Course Title	Marks	Credits
CSE-4207	Simulation & Modeling	100	3.00
CSEL-4208	Simulation & Modeling Lab	50	1.00
CSE-4209	Distributed Systems	100	3.00
CSEL-4210	Distributed Systems Lab	50	1.00
CSE-4211	Digital Signal Processing	100	3.00
CSEL-4212	Digital Signal Processing Lab	50	1.00
CSE-4213	Network Routing and Switching	100	3.00
CSEL-4214	Network Routing and Switching Lab	50	1.00
CSE-4215	System Programming	100	3.00
CSEL-4216	System Programming Lab	50	1.00
CSE-4217	Distributed Database System	100	3.00
CSEL-4218	Distributed Database System Lab	50	1.00
CSE-4219	Neural Network & Fuzzy System	100	3.00
CSEL-4220	Neural Network & Fuzzy System Lab	50	1.00
CSE-4221	Digital System Design	100	3.00
CSEL-4222	Digital System Design Lab	50	1.00
CSE-4223	Digital Image Processing	100	3.00
CSEL-4224	Digital Image Processing Lab	50	1.00
CSE-4225	Digital Electronics and pulse techniques	100	3.00
CSEL-4226	Digital Electronics and pulse techniques Lab	50	1.00

Detail Course Syllabus

1st Year 1st Semester (1st Semester)

CSE-1101 Computer Fundamentals **Marks: 50** **Credits: 2.00**

Introduction: Brief history and types of computers, application areas, working principle of computer system. Number systems, Binary, Octal and Hexadecimal number system & their arithmetic operations, Conversion of different number systems, codes, BCD, ASCII, EBCDIC, Unicode, Parity bit, Data representation: representation of integer, real, floating point number and character. Basic logic Gates and their truth table, DeMorgan's theorem, Boolean expressions, Implementing circuit from Boolean expressions, SOP, POS, simplifying logic circuit.

Hardware: Basic functional Components of digital computer; I/O unit, memory unit and CPU; Peripheral devices. Single and multi-user systems. Computer Bus architectures, CPU organization. Memory devices. I/O devices.

Software: Basic concept; classification; system and application software. Operating System: importance, components, and basic functions; Overview of DOS, Unix, Windows. Programming Language: classification; assembler, translator.

Computer Networks: Basic concept on LAN, MAN, WAN and Internet system. Basic concept on OSI model and TCP protocols, IP address. Computer Viruses.

Prerequisite: None
Books Recommended:

1. Pradeep K. Sinha, Computer Fundamentals.
2. S. Frence, Computer Science.
3. Warford, Computer Science.
4. Norton, Inside the PC.

CSE-1103 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

Prerequisite: None
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-1104 Structured Programming Language Lab **Marks:50 Credits: 2.00**

Laboratory based on CSE-1102

CSER-1105 Mathematics I (Fundamentals of Mathematics, Differential Calculus & Co-ordinate Geometry)

Marks :100 Credits :3.00

Fundamentals of Mathematics: Real number system, complex numbers and their elementary properties, Rectangular co-ordinates in three dimensions. Functions and relations, Domain, Range, function, Inverse function, Exponential and Logarithmic function. System of linear equations, Determinant, Minor and Cofactors, Cramer's rule, Homogeneous linear system. Fundamental principal of counting, Permutation, Combination. Binomial theorem, Expansion of power of binomial, Binomial theorem, Binomial series.

Graph plotting, straight line, Parabola, Hyperbola, Ellipse, Circle. Geometry: The equations of straight line and plane, sphere, coincide, transformation of axes.

Vector space: Vectors in three dimensions; vector algebra, addition scalar multiplication, dot product, vector product. Set Theory: Different kinds of sets. Basic set operations. Complement of a set, DeMorgan's laws. Order pair and Cartesian product.

Matrices: Definition, Algebra of matrices, Determinants, adjoint of square matrices, inverse of a matrix, Solution of system of linear equations.

Differential Calculus: Limit, Continuity and differentiability, Successive differentiation of various types of function, Libenitz's theorem. Rolle's theorem, Mean value theorem. Taylor's theorem in finite and infinite forms. Maclaurine's theorem in finite and infinite forms. LaGrange's form of remainders. Cauchy's form of remainder's. Expansion of functions. Evaluation of indeterminate forms by L'Hospitals rule.Partial differentiation. Euler's theorem. Tangent and Normal. Subtangent and subnormal in Cartesian and polar co-ordinates. Determination of maximum and minimum values of functions and points of inflexion. Applications. Curvature. Radius of curvature. Center of curvature.

Co-ordinate Geometry: Transformation of co-ordinate axes and its uses; Equation of conics and its reduction to standard forms; Pair of straight lines; Homogenous equations of second degree; Angle between the pair of straight lines Pair of lines joining the origin to the point of intersection of two given curves, circles; System of circles; Orthogonal circles; Radical axis, radical center, properties of radical axes Coaxial circles and limiting points; Equation of ellipse, parabola and hyperbola in Cartesian and polar co-ordinates; Tangents and normals, pair of tangents ; Chord of in terms of its middle points; Pole and polar parametric co-ordinates; Diameters; Conjugates diameters and their properties; Director circles and asymptotes.

Prerequisite: None
Books Recommended:

1. Dewan A. Quddus & Md. Shawkat Hossain, Basic Algebra.
2. Dr. Md. Abdul Matin & Bidhbuson Chakraborty, Differential Calculus.

3. A.F.M Abdur Rahman & P.K. Bhattacharjee, A Text book on Coordinate Geometry with Vector Analysis.
4. Dewan A. Quddus, Md. Shawkat Hossain, Md. Mizanor Rahman, Fundamentals of Mathematics.

CSER-1107 Physics (Heat and Thermodynamics, Structure of Matter, Waves and Oscillations, and Physical Optics)

Marks :100 Credits :3.00

Oscillations and Waves: Simple harmonic motion; Differential equation, Calculation of time period and average energy; Combination of SHMs and Lissajous' figures; Damped and forced oscillations; Resonance; Waves: Progressive and Standing waves; Energy density and Intensity of wave motion; Velocity of longitudinal waves in gaseous medium; Doppler Effect.

Structure of Matter: Classification of solids; Amorphous, crystalline, ceramics and polymers; Atomic arrangements in solids; Lattices, Basis and crystal structure; Unit cell; Different types of crystal systems; Packing in solids; Packing fraction of sc, bcc, fcc structures; X-ray diffraction and Bragg's law; Bonds in solids: Covalent, Ionic, Metallic and Molecular bonds; Introduction to band theory; Distinction among insulator, semiconductor and metal..

Modern Physics: Bohr atom model; Atomic spectra; de Broglie waves; Photoelectric effect; Atomic nucleus; Nuclear forces; Binding energy; Nuclear fission and fusion; Radioactivity; Decay law; Mean-life and half-life; Successive disintegration.

Prerequisite: None
Books Recommended:

1. David Halliday & Robert Resnick, Physics Part I.
2. N. Subrahmanyam, Brij Lal, Optics.
3. N. Subrahmanyam, Brij Lal, Heat and Thermodynamics.

CSERL-1108 Physics Lab **Marks :50 Credits :2.00**

Laboratory experiments based on CSER-1107

CSER-1109 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: Discussion readability, scan and skin reading, generating ideas through purposive reading, reading of selected stories.

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: Communication today, business communication, and different types of business communication.

Listening Skill: The phonemic systems and correct English pronunciation.

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.

Prerequisite: None
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 & Haq ed. A Prose of our Time.

1st Year 2nd Semester (2nd Semester)

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

Concepts of object oriented programming: objects, data and module encapsulation, polymorphism, static and dynamic binding, inheritance. Object oriented programming with C++/Java language: 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, complex and BCD classes, the message based philosophy. Using C++/Java's memory model, using VROOMM overlay technology, 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.

Prerequisite: CSE-1103

Books Recommended:

1. H. Shildt, C++ Complete Reference.
2. Schikt, Teach yourself C++
3. B. Stroustrap, The C++ Programming Language
4. Complete Reference JAVA , Herbert Shieltz
5. Java How to Program, Deitel & Deitel
6. Programming with JAVA, E. Balagurusamy

CSEL-1202 Object Oriented Programming Lab **Marks: 50 Credits: 2.00**

Practical works based on CSE-1201

CSE-1203 Electrical Circuit Analysis **Marks: 50 Credits:2.00**

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.

Prerequisite: None

Book Recommended:

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

CSE-1205 Basic Electronics **Marks: 50 Credits: 2.00**

P-**N junction as a circuit element:** Intrinsic and extrinsic semiconductors, operational principle of p-n junction diode, contact potential, current-voltage characteristics of a diode, simplified DC and AC diode models, dynamic resistance and capacitance.

Diode circuits: Half wave and full wave rectifiers, rectifiers with filter capacitor, characteristics of a Zener diode, Zener shunt regulator, clamping and clipping circuits.

Bipolar Junction Transistor (BJT) as a circuit element: current components, BJT characteristics and regions of operation, BJT as an amplifier, biasing the BJT for discrete circuit.

Metal Oxide Semiconductor Field Effect Transistor (MOSFET) as circuit element: structure and physical operation of an enhancement MOSFET, threshold voltage, Body effect, current-voltage characteristics of an enhancement MOSFET, biasing discrete and integrated MOS amplifier circuits, single-stage MOS amplifiers, MOSFET as a switch,

Operational amplifiers (Op-Amp): Properties of ideal Op-Amps, non-inverting and inverting amplifiers, inverting integrators, differentiator, weighted summer and other applications of Op-Amp circuits, effects of finite open loop gain and bandwidth on circuit performance, logic signal operation of Op-Amp, DC imperfections..

Signal generators: Basic principle of sinusoidal oscillation, Op-Amp RC oscillators, LC and crystal oscillators.

Prerequisite: None

Books Recommended:

1. Boylestad and Nashelsky, Electronic Devices and Circuit Theory.
2. A.P. Malvino, Principles of Electronics
3. B.L. Theraja, Basic Electronics Solid State
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.
8. G.B. Clayton, Operational Amplifiers.

CSEL- 1206 Electrical & Electronics Lab **Marks:50** **Credits:2.00**

In this course students will perform experiments to verify practically the theories and concepts learned in CSE-1203 & CSE-1204

CSER-1207 Mathematics-II (Integral Calculus and Ordinary and Partial Differential Equations)

Marks:100 **Credits:3.00**

Integral Calculus: Definitions of integration. Integration by the method of substitution. Integration by parts. Standard integrals. Integration by the method of successive reduction. Definite integrals, its properties and use in summing series. Walli's formula, Improper integrals, Beta function and Gamma function. Area under a plane curve in Cartesian and polar co-ordinates. Arc lengths of curve in Cartesian and polar co-ordinates, parametric and pedal equations. Intrinsic equation. Volumes of solids of revolution. Volume of hollow solids of revolutions by shall method. Area of surface of revolution.

Ordinary Differential Equation (ODE): Degree and order of ordinary differential equations: Formation of differential equations; Solution of first order differential equations by various methods; Solution of first general linear equations of second and higher orders with constant coefficients; Solution of homogeneous linear equations and its applications; Solution of differential equations of higher order when dependent and independent variables are absent: Solution of differential equation by the method based on factorization of operators.
Partial Differential Equations (PDE): Four rules for solving simultaneous equations, Lagrange's method of solving FIDE of order one; Integral surfaces passing through a given curve; Nonlinear PDE of order one (complete, particular, singular and general integrals): standard forms $f(p,q) = 0$, $z= px + qy + f(p,q)$, $f(p,q,z) = 0$, $f,(x,p) = f2(y,q)$; Charpit's method; Second order PDE: its nomenclature and classifications to canonical (standard) parabolic, elliptic, hyperbolic; Solution by separation of variables. Linear PDE with constant coefficients.

Series Solution: Solution of differential equations in series by the method of Frobenius; Bessel's functions, Legendre's polynomials and their properties.

Prerequisite: None
Books Recommended:

1. B.C.Das & B.N. Mukharjee, Integral Calculus.
2. Howard Anton, Calculus.
3. S.L. Ross, Ordinary Differential Equation.
4. B.D Sharma, Differential Equation.
5. Dr. Md. Abdul Matin & Bidhubusan Chakraborty, Integral Calculus

CSER-1209 Discrete Mathematics **Marks:100 Credits:3.00**

Propositional and Predicate Calculus: Statements and Compound statements, conjunction, disjunction, negation prepositions and truth-tables, tautologies and contradictions logical equivalence, algebra of propositions conditionals, and bi-conditionals, logical implications, theory of inference of prepositional calculus, predicates, statement functions, variables and quantifiers predicate formulas, free and bound variables theory of inference for the predicate calculus Introduction on graphs and trees. Theory of Sets: Basic concepts sets and elements, venn diagram set operations algebra of sets duality classes of sets, power set. Introduction to Principles of mathematical induction. Relations: Basic concepts, pictorial representation of relations inverse relations, compositor relations partitions properties of relations. Functions: Basic concept, graph of functions, one to one, onto functions. Counting: functions and counting, permutations and combinations. Posets and Lattice: Partial ordered sets, lattices, bounded lattices distributed lattices. Algebraic Systems: Operations. Semi groups, groups, subgroups, isomorphism automorphism, homomorphism introduction to rings and fields. Propositional calculus: proposition, argument, contingency, converse, contrapositive, inverse, logical connectors, quantification, universal quantifier, existential quantifier, nested quantifier. Set: partition. Counting: sum rule principle, product rule principle, permutation, combination, pigeonhole principle, inclusion-exclusion principle, Pascal triangle, ordered and unordered partitions. Advanced counting technique: recurrence relations. Methods of proof: strong induction. Graph: degree of a vertex, paths, connectivity, multi-graph, finite-graph, sub-graph, complete graph, weighted graph, homeomorphic graph, isomorphic graph, bipartite graph, trivial graph, regular graph, planar graph, non-planar graph, directed graph, tree graph, forest, graph coloring, distance and diameter, maps, regions, storage of graph: using adjacency matrices and linked lists, spanning tree, BST, traversing of BST. Algebraic systems: identity element, inverses, homomorphism of semigroups, groups, symmetric group, subgroup, normal subgroup, coset, cyclic subgroup, integral domain, ideals, polynomials. Ordered set and Lattices: ordered sets, dual order, quasi-order, linearly ordered sets, ordered subsets, hasse diagram, minimal and maximal elements, first and last elements, consistent enumeration, supremum and infimum, isomorphic ordered sets, well-ordered sets, sub-lattice, isomorphic lattice, join irreducible elements, atoms, complements, complemented lattice.

Prerequisite: None
Books Recommended:

1.Kennath A. Rosen, Discrete Mathematics
2. Schaum's Outline Series, Discrete Mathematics
3. Susamna, Discrete Mathematics with applications

CSEV-1210 Viva-Voce **Marks :50** **Credits: 2.00**

All the courses of 1st & 2nd semesters

2nd Year 1st Semester(3rd Semester)

CSE-2101 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.

Algorithms: Techniques for analysis of algorithms; Methods for the design of efficient algorithms: divide and conquer, greedy method, dynamic programming, back tracking, branch and bound; Basic search and traversal techniques; Topological sorting; Connected components, spanning trees, shortest paths; Flow algorithms; Approximation algorithms; Parallel algorithms; Algebraic simplification and transformations; Lower bound theory; NP-completeness, NP-hard and NP-complete problems.

Prerequisite: CSE-1103

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-2102 Data Structures Lab **Marks:50 Credits:2.00**

Practical works based on CSE– 2101

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.

Prerequisite: None

Books Recommended:

1. T.J. Tocci, Principle of Digital Electronics.

2. R.P. Jain, Modern Digital Electronics.
3. Morris Mano, Digital Electronics.

CSEL-2104 Digital Logic Design Lab Marks:50 Credits:2.00

Practical works based on CSE-2103

CSER-2105 Mathematics -III (Matrices, Vectors and Fourier Analysis)

Marks:100 Credits:3.00

Matrices: Definition of matrix; Different types of matrices; Algebra of matrices; Adjoint and inverse of a matrix; Elementary transformations of matrices; Matrix polynomials; Calay-Hamiltory theory with uges of rank and nullity; Normal and canonical forms; Solution of linear equations; Eigenvalues and eigenvectors.

Vector Space: Definition and properties, subspace, basis and dimension, change of basis; Linear Transmission (LT): definition and properties, linear operator matrix, geometry of LT, standard plane LT.

Vector Algebra: Scalars and vectors, equality of vectors; Addition and subtraction of vectors; Multiplication of vectors by scalars Scalar and vector product of two vectors and their geometrical interpretation; Triple products and multiple products; Linear dependence and vectors.

Vectors Calculus: Differentiation and integration of vectors together with elementary application; Definition of line, surface and volume integrals; Gradient, divergence and curl of point functions, various formulae, Gauss's theorem, Stoke's theorem, Green's theorm.

Fourier Analysis: Real and complex form of Fourier series; Finite transform; Fourier Integral; Fourier transforms and their uses in solving boundary value problems of wave equations.

Prerequisite: None
Books Recommended:

1. H. Anton and C. Rorres, Linear Algebra with applications.
2. S. Lipshtz, Schaum's outline series- Linear Algebra.
3. Md. Abdur Rahman, College Linear Algebra.
4. Md. Abdur Rahman, College Mathematical Methods., Vol-I, II.
5. R.V. Churchill and J. W. Brown, Fourier Series and Boundary Value Problems.
6. Dewan A. Quddus, Linear Algebra.
7. Md. Muklesur Rahman & Riaz Uddin Molla, Linear Algebra.

CSER-2107 : Introduction to Statistics and Probability

Marks:100 Credits:3.00

Definition of statistics, Application of statistics, Population and sample, Collection and representation of statistical data, Tabulation of data, Class intervals, Frequency distribution, Graphical representation of data.

Statistical Measures, Measures of central tendency, Measures of dispersion, Moments, skewness, Kurtosis.

Correlation Theory, Linear correlation, Measures of correlation and significance, Regression and Curve Fitting, Linear and non-linear regression, Curve fitting by method of least squares.

Probability, Definition of Probability and related concepts, Laws of Probability, Probability distributions, Discrete and continuous random variables, Mathematical expectation, Conditional probability.

Stochastic process, Markov chain (discrete and continuous), Queuing theory-Birth process in queuing, Queuing models, (Elementary concepts).

Prerequisite: None.
Books Recommended:

1. M. Nurul Islam, An introduction to statistics and probability.
2. Dr. M.G. Mostafa, Methods of Statistics.
3. Manindra Kumar Ray, Fundamentals of Probability and Probability Distributions.
4. Sheldon M. Ross, Introduction to probability models.
5. Mehedi-Stochastic Process, Wiley Fastern Ltd.
6. Bartiett, M.S-Introduction to Stochastic Process.

CSER-2109 Economics **Marks: 50** **Credits: 2.00**

Introduction to economics, Economics and engineering, Different economic systems, Fundamental economic problems. Basic elements of demand, supply and product market. Theory of utility and preferences, consumer's surplus, Theory of production and cost, Theory of the firm and market structure. Optimization.

Introduction to macroeconomics. National income accounting, the simple Keynesian analysis of national income, employment and inflation. Savings, investment and decision making. Fiscal policy and monetary policy- money and interest rate, income and spending.
Economics of development and planning.

Prerequisite: None
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.

CSER-2111 Financial and Managerial Accounting **Marks:100** **Credits: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.

Prerequisite: None
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 2nd Semester(4th Semester)

CSE-2201 Data and Telecommunication **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 HDLG 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, comparison of 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. Introduction to cellular technology, GSM, GPRS, etc. Traffic theory basic queuing system, etc. Recent developments in mobile technology.

Prerequisite: None

Books Recommended:

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

CSE-2203 Database Managment 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.

Prerequisite: None

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:2.00**

Practical works based on CSE-2203

CSER-2205 Mathematics-IV(Complex Variable, Laplace Transform)

Marks:100 Credits:3.00

Complex Variables, Complex numbers, Properties, Modulus & amplitudes of complex numbers. Analytic functions, Cauchy - Riemann equations, Polar form of C-R equation, Line integral of complex function, Complex integration, Cauchy 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, Residue, Fundamental theorem of algebra, Evaluation & calculation of residues of real definite integral by contour integrations, Bilinear mappings, mappings by elementary functions, Conformal mapping.

Vector Analysis, Limit, continuity and differentiability of scalar and vector point functions, Vector integration, line, surface and volume integrals, Gradient, Divergeance and Curl of point function, Gauss's Theorem, Stocks Theorem and Green's Theorem.

Beta and Gamma Functions, The factorial function, Different forms of Beta function, Reduction formula, Transformation of Gamma function, Relation between Beta and Gamma function. Fourier Series, Periodic functions and Trigonometric series, Fourier series, Fourier series, Process of determining the co-efficient, Fourier cosine and sine series.

Prerequisite: None.
Books Recommended:

1. R.V. Churchill, Complex Variable and Applications.
2. M.L.Khanna, Complex Variable.
3. Md. Abdur Rahman, College Mathematical Methods.

CSER-2207 Numerical Analysis **Marks:100 Credits:3.00**

LU factorization: Introduction. Gaussian elimination. LU factorization. Pivoting. Existence and uniqueness of LU factorization. Symmetric positive definite matrices. Cholesky factorization. Band matrices.

QR factorization: Orthogonal matrices. QR factorization. The Gram–Schmidt algorithm. Givens rotation. Householder reflections.

Iterative methods: Matrix and vector norms. Basic iterative schemes: Jacobi, Gauss–Seidel, simple iteration. Necessary and sufficient conditions for convergence.

Linear least squares: Normal equation. QR and least squares.

Orthogonal polynomials: Orthogonal systems. Three–term recurrence relation.

Polynomial interpolation: Lagrange formula. Divided differences. Newton formula.

Error bounds for polynomial interpolation: Error bound for Lagrange interpolation. Chebyshev polynomials.

Approximation of linear functional: Numerical integration. Gaussian quadrature. Numerical differentiation. The Peano kernel theorem and its application.

Prerequisite: None
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

CSE-2209 Algorithms **Marks:100** **Credits:3.00**

Algorithms: Techniques for analysis of algorithms; Methods for the design of efficient algorithms: divide and conquer, greedy method, dynamic programming, back tracking, branch and bound; Basic search and traversal techniques; Topological sorting; Connected components, spanning trees, shortest paths; Flow algorithms; Approximation algorithms; Parallel algorithms; Algebraic simplification and transformations; Lower bound theory; NP-completeness, NP-hard and NP-complete problems.

Prerequisite: CSE-1103

Books Recommended:

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

4.Drozdek, Adam, Data Structure

CSEL-2207 Algorithms Lab **Marks:50** **Credits:2.00**

Practical works based on CSE-2209

CSEV-2212 Viva-Voce **Marks :50** **Credits:2.00**

All the courses of 3rd & 4th semesters

3rd Year 1st Semester(5th Semester)

CSE- 3101 Theory of Computation **Marks:100** **Credits:3.00**

Language theory; Finite automata: deterministic finite automata, nondeterministic finite automata, equivalence and conversion of deterministic and nondeterministic finite automata, pushdown automata; Context free languages; Context free grammars; Turing Machines: basic machines, configuration, computing with Turing machines, combining Turing machines; Undecidability.

Prerequisite: None
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-3103 Mathematical Analysis for Computer Science

Marks: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

Prerequisite: None
Books Recommended:

1.Robert Dautory, Numerical methods & Mathematical analysis
2. Roger Cook, Mathematical Analysis for CS
3.Waller Rudin, Principles of Mathematical Analysis

CSE-3105 Operating Systems **Marks: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:** Berkeley fast 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

Prerequisite: None
Books Recommended:

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

CSEL-3106 Operating Systems Lab **Marks:50 Credits:2.00**

Practical works based on CSE-3105

CSE-3107 Microprocessor and Assembly Language

Marks:100 Credits:3.00

Microprocessors: Concept of Microprocessor; Evolution of microprocessor; Internal architecture of Intel 8085,8086/8088 microprocessor; Instruction set and format, Programming in machine and assembly Language, Interrupt structure, DMA, I/O operation, Microprocessor interface ICs, Peripheral interfacing, Microprocessor Based system design, Coprocessor, Multiprocessor system; Intel 80286,80386, Pentium microprocessors; memory management scheme, protection mechanism.

Prerequisite: None
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-3108 Microprocessor and Assembly Language Lab

Marks:50 Credits:2.00

Practical works based on CSE-3107

CSE-3109 Computer Architecture **Marks:100 Credits: 3.00**

Information representation; Measuring performance; Instructions and data access methods: operations and operands of computer hardware, representing instruction, addressing styles; Arithmetic Logic Unit (ALU) operations, floating point operations, designing ALU; Processor design: datapaths – single cycle and multicycle implementations; Control Unit design - hardwared and microprogrammed; Hazards; Exceptions; Pipeline: pipelined datapath and control, superscalar and dynamic pipelining; Memory organization: cache, virtual memory, channels; DMA and Interrupts; Buses; Multiprocessors: types of multiprocessors, performance, single bus multiprocessors, multiprocessors connected by network, clusters.

Prerequisite: None
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

3rd year 2nd Semester (6th Semester)

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

Computer, lexical Analysis Lexical Analysis, regular expressions, regular languages, Syntax Analysis: syntax analysis, context free grammars, bottom-up parsing ; LR (0) parsing SLR parsing, LR (I) paring, LALR (1) parsing, classification of context-free grammars and language, syntactic error recovery, syntax directed Definitions, attributes evaluation, Abstract syntax trees, symbol Tables type checking, Semantic checks for Inheritance Sub typing and for overloading generation of intermediate code: Generation of intermediate code-translation of Boolean expression, switch/case statements, runtime structures, Back patching, Generation of un-optimized target code. Advanced Topic: Control flow graphs, live-variable analysis allocation optimization register allocation, by graph coloring Available expression analysis, Global common sub expression elimination, Dominators, Loops in control flow graphs, Defuse & use-def chains, Loop invariant, code motion, Partial redundancy elimination, constant propagation, optimizing Object-oriented programs, copy propagation, phase ordering of optimization, Instruction Scheduling optimizations for memory hierarchies.

Prerequisite: CSE-2101
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:2.00**

Practical works based on CSE-3201

CSE-3203 :Computer Networks **Marks:100 Credits:3.00**

Categories of networks, network topologies, overview of TCP/IP protocol suite and OSI model. Multiple access- CSMA/CD, CSMA/CA, CDMA. Local Area Networks- traditional Ethernet, Fast Ethernet and Gigabit Ethernet, connecting devices, repeater, hub, bridge and switch. Circuit and packet Switching: Space division and time division switching, single node networks, digital PBX, Packet switching, Circuit switching and hybrid switching, Virtual circuit and data-grams, routing, traffic control, packet switching and X.25 standard.
Data Communication Techniques: Asynchronous and synchronous transmission. Error detection and correction. CRC and other methods. RS232 (or EIA 232D) V.24 interface standard.
Data Link Control: Flow control, Error Detection – Parity and CRC, Error Control (Stop and Wait, Go back N ARQ, Selective Reject ARQ), High-level Data Link Control (HDLC).
Wireless LAN, IEEE 802.11 and Bluetooth. Cellular telephony and satellite networks. Internetworks, IP address, ARP and ICMP. Routing techniques, distance vector routing and link state routing, multicast routing. Transport layer- UDP and TCP protocols, DNS and address resolution. Internet applications, e-mail and file transfer SMTP and FTP, HTTP and world wide web. Virtual circuit switching and, Frame Relay and ATM, congestion control and quality of service in frame relay and ATM.

Prerequisite: CSE-2201

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- 3204 Computer Networks Lab **Marks:50 Credits:2.00**

Practical works based on CSE-3203

CSE-3205: Software Engineering and Information System Design

Marks:100 Credits:3.00

Concepts of Software Engineering, Software Engineering paradigms, Different phases of software System Development, Different types of information, qualities of information. Project Management Concepts, Software process and project Metrics, Software Project Planning, Risk Analysis and management, Project Scheduling and Tracking. Analysis Concepts and principles: requirement analysis, Analysis modeling, data modeling. Design concepts and principles, Architectural design, User Interface design, Object Oriented software development and design: Iterative Development and the Unified Process. Sequential waterfall life cycles, Inception. Use case model for requirement writing, Elaboration using System Sequence Diagram, Domain Model. Visualizing concept classes. UML diagrams, Interaction and Collaboration Diagram for designing Software. Designing Objects with responsibilities. GRASP patterns with General Principles in assigning responsibilities: Information expert, Creator, Low Coupling and High Cohesion, Creating design class diagrams and mapping design to codes. Advanced GRASP patterns: Polymorphism, Pure Fabrication, Indirection, Project Variation. GoF Design Patterns: Adapter, Factory, Singleton, Strategy, Composite, Façade, and Observer. Software Testing: White Box and Black Box testing. Basis Path Testing. Testing for specialized environment. Software testing strategies: Unit Testing, Integration Testing, Validation Testing, System Testing, Art of debugging. Analysis of System Maintenance and upgrading: Software repair, downtime, error and faults, specification and correction, Maintenance cost models, documentation. Software Quality Assurance, Quality factors. Software quality measures. Cost impact of Software defects. Concepts of Software reliability, availability and safety. Function based metrics and bang metrics. Metrics for analysis and design model. Metrics for source code, testing and maintenance.

Prerequisite: None

Books Recommended:

1. Rajaraman V.,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 and Information System Design Lab

Marks:50 Credits:2.00

Practical works based on CSE-3205

CSE-3207: Artificial Intelligence **Marks:100** **Credits:3.00**

Overview of Al, General concepts of knowledge, LISP and other Al programming languages ; Review of Un-Informed Search Strategies and game playing ; Informed search Strategies : A*, Heuristic functions, Memory Bounded Search (IDA*, SMA*) Iterative Improvement Search (Hill Climbing, Simulated Annealing), constraint satisfaction problems. Review of Propositional logic, first order Logic, Introduction to Planning, Partial Order Planning, Bayes Rule and its use in probabilistic reasoning ; Bclicf Networks and Decision Networks; Learning Decision Trees ; Learning General Logical descriptions-Hypothesis, Examples. Current Best Hypothesis Search, Least Commitment Search; Learning Neural and Belief Networks ANN, Perceptions, MFFN (Back propagation, Applications of Neural Networks, Bayenan Methods for learning Belief Networks, Genetic Algorithm, Reinforced learning.

Prerequisite: None
Books Recommended:

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

CSEL-3208 :Artificial Intelligence Lab **Marks:50** **Credits:1.00**

Practical works based on CSE-3207

CSEV-3210 Viva-Voce **Marks :50** **Credits: 2.00**

All the courses of 5th & 6th semesters

4th Year 1st Semester (7th Semester)

CSE-4101:Computer Peripheral and Interfacing **Marks:100** **Credits:3.00**

Fundamentals of Interfacing: I/O operations: Programmed I/0, Interrupts and Direct memory access, ports and peripheral adapters. Interrupts and Priority Interrupt Controller(8259A): organization, modes of operation, Programmable Timer controller. DMA Controller(8237): organization and operation, DRAM interfacing. Digital Interfacing: Handshaking protocols and Programmable Parallel I/O Prot *(8255):* organization and modes of operation, Keyboard and Alphanumeric display interfacing, Keyboard and Display Controller (8279), Printer Interfacing and Centronics. Analog Interfacing basics: D/A converter ckts, R-2R ladder; A/D converters: Parallel Comparator A/D converter, Successive Approximation converter, Dual Slope converters, interfacing A/D and D/A converters. Light and Temperature Sensors, Force and Pressure Transducers, Instrumentation amplifiers using transducer bridges; Stepper motor interfacing. Computer buses and Interfacing standards: PCI and PCI express, AGP, USB, SCSI and IEEE 488; Standard Communication Ports: Serial and Parallel ports. Peripherals: Keyboards and Key-switches, CRT and LCD monitors, Laser and Inkjet printers, Optical mouse, Scanners, Other I/O devices: Bar Code, Magnetic Character and Optical Mark Readers; Sound card and MIDI standard

Prerequisite: None

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-4102:Computer Peripheral and Interfacing Lab

Marks:50 **Credits:2.00**

Practical works based on CSE-4101

CSE-4103 :Internet and web Programming **Marks:100** **Credits:3.00**

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.

Prerequisite: None
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.

CSEL-4104 :Internet Programming Lab Marks:50 Credits:2.00

Practical works based on CSE-4103

CSE-4105 :Computer Graphics and multimedia system Marks: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: Raster Scan Graphics: Mid-point Line and Circle Creation Algorithms, Animalizing: Polygons Difference type of polygons, Point location, polygon filling, triangulation. Windowing and Clipping: Window Viewpoint, Zooming, panning, linetext and polygon, clipping Transformation: Homogeneous coordination, Transformation matrices, Transformation in 2D, translation, rotation, sealing, Transformation in 3D translation, rotation, scaling, Projection: Parallel and perspective, isometric projection; Three Dimensional Viewing and representation: Curves, surfaces and volumes with cubic and bicubic splines, B-Reb, CSG, Spatial Occupancy Representations. Hidden Lines and Surface removal: Painter's algorithm, Z-Buffering, Rendering: Light Models, Shading Interpolation Technique constant, Ground and Phong, Ray Tracing. Image File Format: PPM file, BMP file. Introduction to Graphics Programming: The nature of computer animation, simulation, kinematics, barometries, dynamics, metamorphosis.

Multimedia systems - introduction; Coding and compression standards; Architecture issues in multimedia; Operating systems issues in multimedia - real-time OS issues, synchronization, interrupt handling; Database issues in multimedia - indexing and storing multimedia data, disk placement, disk scheduling, searching for a multimedia document; Networking issues in multimedia - Quality-of-service guarantees, resource reservation, traffic specification, shaping, and monitoring, admission control; Multicasting issues; Session directories; Protocols for controlling sessions; Security issues in multimedia – digital water-marking, partial encryption schemes for video streams; Multimedia applications - audio and video conferencing, video on demand, voice over IP.

Prerequisite: None

Books Recommended:

1.Foley,Computer Graphics
2. Steven , Roger, Advance Graphics Theory
3. A.K. Peters, Fundamentals of Computer Graphics
4. Prabhat Andleigh and Kiran Thakrar, Multimedia Systems Design.
5. Ralf Steinmetz, Multimedia Systems.
6. S. V. Raghavan, Satish K. Tripathi, Networked Multimedia Systems.
7. Borko Furht, Multimedia Systems and Techniques.

CSEL-4106 :Computer Graphics and multimedia systemLab

Marks:50 Credits:2.00

Practical works based on CSE-4105

CSE-4 Option-I**

CSE-4107: Cryptography and Network Security Marks: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.

Prerequisite: None

Books Recommneded:

1. Nitesh Dhanjani, Justin Clarke- Network Security Tools Writing, Hacking, and Modifying Security Tools
2.MC Nab, Network Security Assessment.
3.Chuvakin, Peikari, Security Warrior
4.Lockhart, Network Security Hacks.
5. Charis Brenton. Mastering Network Security
6. John E. Canavan, The Fundamentals of Network Security.
7. Joel Scambray, Stuart McClure, George Kurtz, - Hacking Exposed.
8. W. Stallings, Cryptography and network security

CSE-4109 :Fiber Optic Communication **Marks:100 Credits:3.00**

Basics of fiber optic communication systems, How optical fibers conduct light, attenuation, intermodal and chromatic dispersion, bit rate and bandwidth, Maxwell's equations, Propagation of EM waves, Details of single mode and multimode fibers, fabrication, cabling and installation, fiber cable connectorization and testing, light source and transmitter, receiver.

Component of a fiber optic networks, transceivers for fiber optic networks, semiconductor optical networks, Erbium-doped fiber amplifiers. Passive components, switches and functional modules of fiber optic networks, couplers/splitters, WDM MUX/DEMUX, filters, isolators, circulators and attenuators, optical switches and functional modules, an introduction to fiber optic network.

Prerequisite: None

Books Recommended:

1. John M. Senior, Optical Fiber Communications.
2. Djafar K. Mynbaev & Lowell L. Scheiner, Fiber-Optic Communications Technology.
3. D.C. Agarwal, Fibre Optic Communication.
4. Gerd Keiser, Optical Fiber Communications.
5. G.P. Agrawal, Nonlinear Fiber Optics.
6. Stamatios V. Kartalopoulos, DWDM.
7. Paul E. Green, Fiber Optic Networks.

CSE-4111: 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, Parzen estimation,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 Expectation-Maximization, Hidden Markov models, Viterbi algorithm, Baum-Welch algorithm, Linear dynamical systems, Kalman filtering and smoothing, Bayesian networks, independence diagrams, Decision trees, Multi-layer Perceptrons.

Prerequisite: None

Books Recommended:

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

CSE-4113: Basic Graph Theory **Marks:100 Credits:3.00**

Graphs: simple graphs, digraphs, subgraphs, vertex-degrees, walks, paths and cycles; Trees, spanning trees in graphs, distance in graphs; Complementary graphs, cut-vertices, bridges and blocks, k-connected graphs; Euler tours, Hamiltonian cycles, Chinese Postman Problem, Traveling Salesman Problem; Chromatic number, chromatic polynomials, chromatic index, Vizing's theorem, planar graphs, perfect graphs.

Prerequisite: None
Books Recommended:

1. Diestel, Computer Graphs Theory
2. Wiley, Graphs Theory
3. Douglas B. Introduction to Graphs Theory

CSEP-4114:Project & Thesis **Marks:100 Credits:3.00**

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.

Prerequisite: All the core courses of 1st to 6th semester.

4th Year 2nd Semester(8th Semester)

CSE-4201: Design and Testing of VLSI Systems **Marks:100 Credits :3.00**

Introduction to MOS technology POMS, NMOS and CMOS, transistors, CMOS Fabrication: The P-well process, The N-well process. BiCMOS Technology. BICMOS fabrication in an n-well process. Fluid model, Electrical, characteristics, Operation of MOS transistor as a switch and amplifier, MOS inverters, MOS. Fabrication steps, steps stick diagrams, design rules and layout, Lambda-based design rules, contact cuts, double metal MOS process rules. MOS circuits, Inverter delay and its analysis. Propagation delay. 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. Hierarcihcal veiw 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, Boundary scan technique.

Prerequisite: None
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-4202: Design and Testing of VLSI Systems Lab **Marks:50 Credits :1.00**

Practical works based on CSE-4201

CSE-4205: Wireless Mobile Communications **Marks:50 Credits :2.00**

Evolution of wireless communications, Characteristics of the wireless medium, Mobile radio channel modeling, Modulation techniques and their performance, Multiple access techniques (F/TDMA, CDMA, SDMA, MU-MIMO, OFDMA), Capacity enhancement methods (Power control, receiver design), Wireless system design fundamentals, Cooperative communications Introduction to wireless networks, Wireless WANS:GSM and TDMA Technology, CDMA Technology, IS-95, IMT-2000, Broadband and AD HOC Networks: Introduction to Wireless LANs, IEEE 802.11 WLANs, Ad Hoc Networking and WPAN.

Concept, evolution and fundamentals. Analog and digital cellular systems. Cellular Radio System: Frequency reuse, co-channel interference, cell splitting and components. Mobile radio propagation: Propagation characteristics, models for radio propagation, antenna at cell site and mobile antenna. Frequency Management and Channel Assignment: Fundamentals, spectrum utilization, fundamentals of channel assignment, fixed channel assignment, non-fixed channel assignment, traffic and channel assignment. Handoffs and Dropped Calls: Reasons and types, forced handoffs, mobile assisted handoffs and dropped call rate. Diversity

Techniques: Concept of diversity branch and signal paths, carrier to noise and carrier to interference ratio performance. Digital cellular systems: Global system for mobile

Prerequisite: None
Books Recommended :

1. Theodore S. Rappaport - Wireless Communication, Principles and Practice.
2. P. Nicopolitidis, M.S. Obaidat, G.I. Papadimitriou – Wireless Networks.
3. Kaveh Pahlavan & Prsshant Krishnamurthy, Principles of Wireless Networks.
4. S. Haykin and M. Moher, Modern Wireless Communications

CSE- 42 & CSEL-42*** Option- II A and Option- II B**

CSE-4207 :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.

Prerequisite: None
Books Recommended

1. G. Gordon, System Simulation

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

CSEL-4208 Simulation & Modeling Lab **Marks:50 Credits :1.00**

Practical works based on CSE-4207

CSE- 4209: Distributed Systems **Marks: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.

Prerequisite: None
Books Recommended:

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

CSEL-4210 :Distributed Systems Lab **Marks:50 Credits :1.00**

Practical works based on CSE-4209

CSE-4211: 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.

Prerequisite: None
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-4212:Digital Signal Processing Lab **Marks:50 Credits :1.00**

Practical works based on CSE-4211

CSE-4213: 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 etc QoS Routing: QoS Network, Packet Scheduling, TCP/IP Queue Management, QoS IntServ: Admission control, Signaling Protocol(RSVP), Traffic Policing etc. QoS DiffServ: Policy based routing, Bandwidth Broker etc, QoS in Wireless network, Real Time Traffic over Internet: VoIP, RTP, RTCP, Security Issues in routing.

Prerequisite :CSE-3203
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-4214: Network Routing and Switching Lab **Marks:50 Credits :1.00**

Practical works based on CSE-4213

CSE-4215: 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.

Prerequisite: CSE-3105
Books Recommended:

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

CSEL-4216: System Programming Lab **Marks:50 Credits :1.00**

Practical works based on CSE-4215

CSE-4217: 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.

Prerequisite: CSE-2203
Books Recommended:

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

CSEL-4218: Distributed Database System Lab **Marks:50 Credits :1.00**

Practical works based on CSE-4217

CSE-4219: 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

Prerequisite: None
Books Recommended:

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

3. Schalkoft, Rebert J., Artificial neural Networks

CSEL-4220: Neural Network & Fuzzy System Lab **Marks:50 Credits:1.00**

Practical works based on CSE-4219

CSE-4221: 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.

Prerequisite: CSE-2103 & CSE-3107
Books Recommended:

CSEL-4222: Digital System Design Lab **Marks:50 Credits:1.00**

Practical works based on CSE-4221

CSE-4223: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

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

CSEL-4224: Digital Image Processing lab **Marks:50 Credits:1.00**

Practical works based on CSE-4223

CSE – 4225: Digital Electronics and Pulse Techniques Marks:100 Credits:3.00

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 astable multivibrators; Schmitt trigger; Blocking oscillators and time-base circuit. Timing circuits. Simple voltage sweeps, linear current sweeps.

Recommended Books:

1. Millman & Taub : “Pulse, Digital and Switching waveform”
2. Taub & Schilling :"Digital Electronics"
3. R. P. Jain :"Digital Electronics"
4. Millman & Halkias :"Microelectronics"

CSEL-4226: Digital Electronics and Pulse Techniques Lab Marks:50 Credits:1.00.

Laboratory works based on **CSE-4225**

CSEV-4228 Viva-Voce Marks :50 Credits: 1.00

All the courses of 7th & 8th semesters

CSEP-4230: Project & Thesis: (Continued) Marks:100 Credits :3.00