Course Curriculum of the Department of Computer Science and Engineering

Courses offered by CSE Department

Core Courses:

CSE 100 Introduction to Computer Systems
4 hours in a week, 2.00 Cr.

Introduction to computations; Early history of computing devices; Computers; Major components of a computer; Hardware: processor, memory, I/O devices; Software: Operating system, application software; Basic architecture of a computer; Basic Information Technology; The Internet; Number system: binary, octal, hexadecimal, binary arithmetic; Basic programming concepts; Program development stages: flow charts; Programming constructs: data types, operators, expressions, statements, control statements, functions, array.

EEE 163 Introduction to Electrical Engineering
3 hours in a week, 3.00 Cr.

Fundamental electrical concepts and measuring units. Direct current: voltage, current, resistance and power. Laws of electrical circuits and methods of network analysis; Introduction to magnetic circuits. Alternating current: instantaneous and r.m.s. current, voltage and power, average power for various combinations of R, L and C circuits, phasor representation of sinusoidal quantities.

EEE 164 Introduction to Electrical Engineering Sessional
3 hours in a week, 1.50 Cr.

Laboratory works based on EEE 163.

MATH 141 Differential Calculus and Co-ordinate Geometry
3 hours in a week, 3.00 Cr.

Differential Calculus: Limits, continuity and differentiability; Successive differentiation of various types of functions; Leibniz's Theorem; Rolle's Theorem; Mean value Theorem in finite and infinite forms; Lagrange's form of remainders; Cauchy's form of remainder; Expansion of functions; Evaluation of indeterminate forms by L'Hospital's rule; Partial

differentiation; Euler's Theorem; Tangent and Normal, Subtangent and subnormal in cartesian and polar co-ordinates; Maximum and minimum values of functions of single variable; Points of inflexion; Curvature, radius of curvature, center of curvature; Asymptotes, curve tracing.

Co-ordinate Geometry: Transformation of co-ordinates axes and its uses; Equation of conics and its reduction to standard forms; Pair of straight lines; Homogeneous equations of second degree; Angle between a 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; Equations of parabola, ellipse and hyperbola in cartesian and polar co-ordinates; Tangents and normals, pair of tangents; Chord of contact; Chord in terms of its middle points; Pole and polar parametric co-ordinates; Diameters; Conjugate diameters and their properties; Director circles and asymptotes.

ME 160 Mechanical Engineering Drawing-I
3 hours in a week, 1.50 Cr.

Introduction; Instruments and their uses; First and third angle projections; Orthographic drawings; Isometric views; Missing lines and views; Sectional views and conventional practices; Auxiliary views.

ME 165 Basic Mechanical Engineering
3 hours in a week, 3.00 Cr.

Sources of energy: conventional and renewable; Introduction to IC engines, Refrigeration and Air conditioning systems.

Statics of particles and rigid bodies; Forces in trusses and frames; Relative motion; Kinematics of particles: Newton's Second Law of Motion; Kinematics of rigid bodies.

Introduction to Robotics; Plane, rotational and spatial motion with applications to manipulators; Geometric configurations: structural elements, linkage, arms and grippers; Motion characteristics.

PHY 109 Physics (Heat and Thermodynamics, Structure of Matter, Waves and Oscillations, and Physical Optics)
4 hours in a week, 4.00 Cr.

Heat and Thermodynamics: Principle of temperature measurements: platinum resistance thermometer, thermo-electric thermometer, pyrometer; Kinetic theory of gases: Maxwell's distribution of molecular speeds, mean free path, equipartition of energy, Brownian motion, Van der Waal's equation of state, review of the First Law of thermodynamics and its application, reversible and irreversible processes, Second Law of thermodynamics, Carnot cycle; Efficiency of heat engines, Carnot's Theorem, entropy and disorder, thermodynamic functions, Maxwell relations, Clausius-Clapeyron Equation, Gibbs Phase Rule, Third Law of thermodynamics.

Structure of Matter: Crystalline and non-crystalline solids, single crystal and polycrystal solids, unit cell, crystal systems, co-ordinations number, crystal planes and directions, sodium chloride and CsCl structure, packing factor, Miller indices, relation between interplanar spacing and Miller indices, Bragg's Law, methods of determination of interplanar spacing from diffraction patterns; 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.

Waves and Oscillations: 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, determination of damping co-efficient, forced oscillation, resonance, two-body oscillations, Reduced mass, 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.

Physical Optics: Theories of light; Interference of light, Young's double slit experiment; Displacements of fringes and its uses; Fresnel Bi-prism, interference at wedge shaped films, Newton's rings, interferometers; Diffraction of light: Fresnel and Fraunhoffer diffraction, diffraction by single slit, diffraction from a circular aperture, resolving power of optical instruments, diffraction at double slit & N-slits-diffraction grating; Polarization: production and analysis of polarized light, Brewster's law, Malus law, Polarization by double refraction, retardation plates, Nicol prism, optical activity, polarimeters, polaroid.

PHY 102 Physics Sessional
3 hours in a week, 1.50 Cr.

Laboratory works based on PHY 109.

CSE 103 Discrete Mathematics
3 hours in a week, 3.00 Cr.

Set theory; Relations; Functions; Graph theory; Propositional calculus and predicate calculus; Mathematical reasoning: induction, contradiction and recursion; counting; Principles of inclusion and exclusion; Recurrence relations; Algebraic structures: rings and groups.

CSE 105 Structured Programming Language
3 hours in a week, 3.00 Cr.

Structured programming language: 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

CSE 106 Structured Programming Language Sessional
3 hours in a week, 1.50 Cr.

Laboratory works based on CSE 105.

CHEM 101 Chemistry
3 hours in a week, 3.00 Cr.

Atomic structure, quantum numbers, electronic configuration, periodic table; Properties and uses of noble gases; Different types of chemical bonds and their properties; Molecular structure of compounds; Selective organic reactions; Different types of solutions and their compositions; Phase rule, phase diagram of monocomponent system; Properties of dilute solutions; Thermochemistry, chemical kinetics, chemical equilibria; Ionization of water and pH concept; Electrical properties of Solution.

CHEM 114 Inorganic Quantitative Analysis
3 hours in a week, 1.50 Cr.

Volumetric analysis: acid-base titration, oxidation-reduction titration, determination of Fe, Cu, Ca volumetrically.

HUM 175 English
3 hours in a week, 3.00 Cr.

English phonetics: the places and manners of articulation of the English sounds; Vocabulary; English grammar: construction of sentences, some grammatical problems; Comprehension; Paragraph writing; Précis writing; Amplification; Report writing; Business communication and tenders; Short stories written by some well-known classic writers.

HUM 272 Developing English Skills Laboratory
3 hours in a week, 1.50 Cr.

Grammar: Tense, article, preposition, subject-verb agreement, clause, conditional and sentence structure.

Vocabulary building: Correct and precise diction, affixes, level of appropriateness. Colloquial and standard, informal and formal.

Developing reading skill: Strategies of reading – skimming, scanning, predicting, inferring; analyzing and interpreting variety of texts; practicing comprehension from literary and nonliterary texts.

Developing writing skill: Sentences, sentence variety, generating sentences; clarity and correctness of sentences, linking sentences to form paragraphs, writing paragraphs, essays, reports, formal and informal letters.

Listening skill and note taking: Listening to recorded texts and class lectures and learning to take useful notes based on listening.

Developing speaking skill: Oral skills including communicative expressions for personal identification, life at home, giving advice and opinion, instruction and directions, requests, complaints, apologies, describing people and places, narrating events.

MATH 143 Integral Calculus, Ordinary and Partial Differential Equations, and Series Sol
4 hours in a week, 4.00 Cr.

Integral Calculus: Definitions of integration; Integration by the method of substitutions; Integration by parts; Standard integrals; Integration by the method of successive reduction; Definite integrals and 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; Area of the region enclosed by two curves in cartesian and polar co-ordinates; Trapezoidal rule, Simpson's rule. Arc lengths of curves in cartesian and polar co-ordinates, parametric and pedal equations; Intrinsic equation; Volume of solids of revolution; Volume of hollow solids of revolution by shell method. Area of surface of revolution; Jacobian, multiple integrals and their application.

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 order but higher degree ordinary differential equations; Solution of 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 of the form; Lagrange's method of solving PDE of order one; Integral surfaces passing through a given curve; Nonlinear PDE of order one (complete, particular, singular and general integrals): standard forms $f(p,q) = 0$, $z = px + qy + f(p,q)$, $f(p,q,z) = 0$, $f1(x,p) = f2(y, q)$; 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.

CSE 201 Object Oriented Programming Language
3 hours in a week, 3.00 Cr.

Philosophy of Object Oriented Programming (OOP); Advantages of OOP over structured programming; Encapsulation, classes and objects, access specifiers, static and non-static members; Constructors, destructors and copy constructors; Array of objects, object pointers, and object references; Inheritance: single and multiple inheritance; Polymorphism: overloading, abstract classes, virtual functions and overriding;

Exceptions; Object Oriented I/O; Template functions and classes; Multi-threaded Programming.

Reference languages: C++ and Java.

CSE 202 Object Oriented Programming Language Sessional
3 hours in a week, 1.50 Cr.

Laboratory works based on CSE 201.

CSE 203 Data Structures
3 hours in a week, 3.00 Cr.

Internal data representation; Abstract data types; Elementary data structures: arrays, lists, stacks, queues, trees, graphs; Advanced data Structures: heaps, Fibonacci heaps, B-trees; Recursion, sorting, searching, hashing, storage management.

CSE 204 Data Structures Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 203.

CSE 205 Digital Logic Design
3 hours in a week, 3 Cr.

Digital logic: Boolean algebra, De Morgan's Theorems, logic gates and their truth tables, canonical forms, combinational logic circuits, minimization techniques; Arithmetic and data handling logic circuits, decoders and encoders, multiplexers and demultiplexers; Combinational circuit design; Flip-flops, race around problems; Counters: asynchronous counters, synchronous counters and their applications; PLA design; Synchronous and asynchronous logic design; State diagram, Mealy and Moore machines; State minimizations and assignments; Pulse mode logic; Fundamental mode design.

CSE 206 Digital Logic Design Sessional
3 hours in a week, 1.50 Cr.

Laboratory works based on CSE 205.

EEE 263 Electronic Devices and Circuits
4 hours in a week, 4.00 Cr.

Introduction to semiconductors, p-type and n-type semiconductors; p-n junction diode characteristics; Diode applications: half and full wave rectifiers, clipping and clamping circuits, regulated power supply using zener diode.

Bipolar Junction Transistor (BJT): principle of operation, I-V characteristics; Transistor circuit configurations (CE, CB, CC), BJT biasing, load lines; BJTs at low frequencies; Hybrid model, h parameters, simplified hybrid model; Small-signal analysis of single and multi-stage amplifiers, frequency response of BJT amplifier.

Field Effect Transistors (FET): principle of operation of JFET and MOSFET; Depletion and enhancement type NMOS and PMOS; biasing of FETs; Low and high frequency models of FETs, Switching circuits using FETs; Introduction to CMOS.

Operational Amplifiers (OPAMP): linear applications of OPAMPs, gain, input and output impedances, active filters, frequency response and noise.

Introduction to feedback, Oscillators, Silicon Controlled Rectifiers (SCR), TRIAC, DIAC and UJT: characteristics and applications; Introduction to IC fabrication processes.

EEE 264 Electronic Devices and Circuits Sessional
3 hours in a week, 1.50 Cr.

Laboratory works based on EEE 263.

MATH 241 Complex Variable and Statistics
3 hours in a week, 3.00 Cr.

Complex Variable: Complex number system; General functions of a complex variable; Limits and continuity of a function of complex variable and related theorems; Complex differentiation and the Cauchy–Riemann Equations; Mapping by elementary functions; Line integral of a complex function; Cauchy's Integral Theorem; Cauchy's Integral Formula; Liouville's Theorem; Taylor's Theorem and Laurent's Theorem. Singular

points; Residue; Cauchy's Residue Theorem. Evaluation of residues; Contour integration; Conformal mapping.

Statistics: Frequency distribution; Mean, median, mode and other measures of central tendency; Standard deviation and other measures of dispersion; Moments, skewness and kurtosis; Elementary probability theory and discontinuous probability distribution, (binomial, Poisson and negative binomial); Characteristics of distributions; Elementary sampling theory; Estimation; Hypothesis testing and regression analysis.

CSE 207 Algorithms
3 hours in a week, 3 Cr.

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.

CSE 208 Algorithms Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory work based on CSE 207.

CSE 209 Digital Electronics and Pulse Techniques
3 hours in a week, 3 Cr.

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-flops, counters and register, memory systems, PLAs; A/D and 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 generation; monostable, bistable and astable multivibrators, Schmitt trigger, blocking oscillators and time-base circuit; Timing circuits; Simple voltage sweeps, linear current sweeps.

CSE 210 Digital Electronics and Pulse Techniques Sessional
3 hours in a week, 1.50 Cr.

Laboratory works based on CSE 209.

CSE 211 Theory of Computation
2 hours in a week, 2 Cr.

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.

CSE 214 Assembly Language Programming
3 hours in a week, 1.50 Cr.

Hardware architecture and software architecture; Instruction types and their formats; Assembly program format; Assembly process; Interrupts and system services; Addressing methods; High level control structure formation; Use of subroutines and macros; Numeric processing and string processing; Concurrent processes and high level linking; Disk geometry, file system and file I/O handling.

EEE 269 Electrical Drives and Instrumentation
3 hours in a week, 3.00 Cr.

Introduction to three phase circuits, alternators and transformers; Principles of operation of DC, synchronous, induction, universal, and stepper motors; Thyristor and microprocessor based speed control of motors.

Instrumentation amplifiers: differential, logarithmic and chopper amplifiers; Frequency and voltage measurements using digital techniques; Recorders and display devices, spectrum analyzers and logic analyzers; Data acquisition and interfacing to microprocessor based systems; Transducers: terminology, types, principles and application of photovoltaic, piezoelectric, thermoelectric, variable reactance and opto-electronic transducers; Noise reduction in instrumentation.

EEE 270 Electrical Drives and Instrumentation Sessional
3 hours in a week, 1.50 Cr.

Laboratory works based on EEE 269.

MATH 243 Matrices, Vectors, Fourier Analysis, and Laplace Transforms
4 hours in a week, 4.00 Cr.

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

Vector Spaces: Definition and properties, subspaces, basis and dimension, change of basis; Linear Transformation (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 independence of vectors.

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

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.

Laplace Transforms: Definition; Laplace transforms of some elementary functions; Sufficient conditions for existence of Laplace transforms; Inverse Laplace transforms; Laplace transforms of derivatives. The unit step function; Periodic function; Some special theorems on Laplace transforms; Partial fraction; Solutions of differential equations by Laplace transforms; Evaluation of improper integrals.

CSE 300 Technical Writing and Presentation
3 hours in alternate week, 0.75 Cr.

Issues of technical writing and effective oral presentation in Computer Science and Engineering; Writing styles of definitions, propositions, theorems and proofs; Preparation of reports, research papers, theses and books: abstract, preface, contents, bibliography and index; Writing of book reviews and referee reports; Writing tools: LATEX; Diagram drawing software; presentation tools.

CSE 303 Database
3 hours in a week, 3.00 Cr.

Concepts of database systems; Models: Entity-Relationship model, Relational model; Relational algebra; SQL; Integrity constraint; Relational database design; File organization and retrieval, file indexing; Transaction manager; Concurrency controller; Recovery manager; Security system; Database administration; Advanced database management systems: distributed, multimedia, object-oriented, object-relational; Some applications using SQL.

CSE 304 Database Sessional
3 hours in a week, 1.50 Cr.

Laboratory works based on CSE 303.

CSE 305 Computer Architecture
3 hours in a week, 3.00 Cr.

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.

CSE 307 Software Engineering and Information System Design
4 hours in a week, 4.00 Cr.

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.

CSE 308 Software Engineering and Information System Design Sessional
3 hours in a week, 1.50 Cr.

Lab works based on CSE307 and a term project.

CSE 309 Compiler
3 hours in a week, 3.00 Cr.

Introduction to compiling; Basic issues; Lexical analysis; Syntax analysis; Syntax-directed translation; Semantic analysis: type-checking; Run-time environments; Intermediate code generation; Code generation; Code optimization.

CSE 310 Compiler Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 309 and project works using some lexical analyzer and parser designing tools.

CSE 311 Data Communication-I
3 hours in a week, 3.00 Cr.

Signal and random processes; Review of Fourier Transform; Hilbert Transform, continuous wave modulation: AM, PM, FM; Sampling theorem; Pulse modulation: PAM, PDM, PPM, PCM, companding, delta modulation, differential PCM; Multiple access techniques: TDM, FDM; Digital modulation: ASK, PSK, BPSK, QPSK, FSK, MSK, constellation, bit error rate (BER); Noise; Echo cancellation; Intersymbol Interference; Concept of channel coding and capacity.

CSE 301 Mathematical Analysis for Computer Science
3 hours in a week, 3.00 Cr.

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.

CSE 313 Operating System
3 hours in a week, 3.00 Cr.

Operating System: its role in computer systems; Operating system concepts; Operating system structure; Process: process model and implementation, Inter-Process

Communication (IPC), classical IPC problems, process scheduling, multiprocessing and time-sharing; Memory management: swapping, paging, segmentation, virtual memory; Input/Output: hardware, software, disk, terminals, clocks; Deadlock: resource allocation and deadlock, deadlock detection, prevention and recovery; File Systems: files, directories, security, protection; Case study of some operating systems.

CSE 314 Operating System Sessional
3 hours in a week, 1.50 Cr.

Laboratory works based on CSE 313.

CSE 315 Microprocessors and Microcontrollers
3 hours in a week, 3.00 Cr.

Introduction to 8-bit, 16-bit, and 32-bit microprocessors: architecture, addressing modes, instruction set, interrupts, multi-tasking and virtual memory; Memory interface; Bus interface; Arithmetic co-processor; Microcontrollers; Integrating microprocessor with interfacing chips.

CSE 316 Microprocessors and Microcontrollers Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 315.

CSE 317 Numerical Methods
3 hours in a week, 3 Cr.

Introduction; Solution of algebraic and transcendental equations: method of iteration, False Position method, Newton-Rhapson method; Solution of simultaneous linear equations: Cramer's rule, Iteration method, Gauss-Jordan Elimination method, Choleski's process; Interpolation: diagonal and horizontal difference, differences of a polynomial, Newton's formula for forward and backward interpolation, Spline interpolation; Numerical differentiation and integration; Solution of ordinary differential equations: Euler's method, Picard's method, Milne's method, Taylor's series method, Runge-Kutta method; Least squares approximation of functions: linear and polynomial regression, fitting exponential and trigonometric functions.

CSE 321 Computer Networks
4 hours in a week, 4.00 Cr.

Protocol hierarchies; Data link control: HLDC; DLL in Internet; DLL of ATM; LAN Protocols: Standards IEEE 802.*; Hubs, Bridges, and Switches, FDDI, Fast Ethernet; Routing algorithm; Congestion control; Internetworking, WAN; Fragmentation; Firewalls; IPV4, IPV6, ARP, RARP, Mobile IP, Network layer of ATM; Transport protocols; Transmission control protocol: connection management, transmission policy, congestion control, timer management; UDP; AAL of ATM; Network security: Cryptography, DES, IDEA, public key algorithm; Authentication; Digital signatures; Gigabit Ethernet; Domain Name System: Name servers; Email and its privacy; SNMP; HTTP; World Wide Web.

CSE 322 Computer Networks Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 321.

CSE 324 Software Development
3 hours in alternate week, 0.75 Cr.

Term project of making software on some practical problems with sound software engineering practices.

CSE 400 Project and Thesis
6 hours in a week, 3.00 Cr.

Study of problems in the field of Computer Science and Engineering.

CSE 401 Artificial Intelligence
3 hours in a week, 3.00 Cr.

Introduction to old and new AI techniques; Knowledge representation; Propositional and first order logic, inference in first order logic; Frame problem; Search techniques in AI; Game playing; Planning; Probabilistic reasoning; Learning in symbolic and non-symbolic representation; Natural language processing. Introduction to expert system.

CSE 402 Artificial Intelligence Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 401.

CSE 403 Digital System Design
3 hours in a week, 3.00 Cr.

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 – hardwired and micro programmed; Microprocessor based designs; Computer BUS standards; Design special purpose controllers.

CSE 404 Digital System Design Sessional
3 hours in a week, 1.50 Cr.

Laboratory works based on CSE 403.

CSE 411 Simulation and Modeling
3 hours in a week, 3.00 Cr.

Simulation modeling basics: systems, models and simulation; Classification of simulation models; Steps in a simulation study; Concepts in discrete-event simulation: event-scheduling vs. process-interaction approaches, time-advance mechanism, organization of a discrete-event simulation model; Continuous simulation models; Combined discreet-continuous models; Monte Carlo simulation; Simulation of queuing systems.
Building valid and credible simulation models: validation principles and techniques, statistical procedures for comparing real-world observations and simulated outputs, input modeling; Generating random numbers and random variates; Output analysis. Simulation languages; Analysis and modeling of some practical systems.

CSE 421 Basic Graph Theory
3 hours in a week, 3.00 Cr.

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.

CSE 423 Fault Tolerant Systems
3 hours in a week, 3.00 Cr.

Introduction of Fault Tolerant Systems and architectures; Fault detection and location in combinational and sequential circuits; Fault test generation for combinational and sequential circuits; Digital simulation as a diagnostic tool; Automatic test pattern generator; Fault modeling; Automatic test equipment, faults in memory, memory test pattern and reliability; Performance monitoring, self checking circuits, burst error correction and triple modular redundancy; Maintenance processors.

CSE 433 Digital Image Processing
3 hours in a week, 3.00 Cr.

Introduction; Digitization of images and its properties; Data structures for image analysis; Image processing; Segmentation: detection of discontinuities, edge linking and boundary detection, thresholding, region oriented segmentation, use of motion in segmentation; Image transforms: Z-transform, 2D Fourier transform, discrete cosine transform, Hadamard transform, Walsh transform, Slant transform; Image compression: run-length coding, transform coding, standards.

CSE 435 Basic Multimedia Theory
3 hours in a week, 3.00 Cr.

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.

HUM 211 Sociology
2 hours in a week, 2.00 Cr.

Sociological perspective: definition, nature, scope and importance of sociology; Sociology and scientific approach: methods of social research, stages of social research; Primary concepts of sociology: society, community, association, institution, group; Social evolution: stages in the evolution of human civilization; Culture: definition,

characteristics, culture contents (material and non-material), cultural lag, culture and civilization; Industrial revolution: the growth of capitalism, features and social consequences, socialism; Social organization: family, forms and functions of family, functions of family in modern industrial society, marriage, forms of marriage, functions of marriage; Social stratification: main types of social stratification – slavery-caste and social class and status, social stratification and social mobility; Social control: religion and morality, custom and public opinion, taboo-law, state and education; Social change: change-evolution-progress-development, factors in social change; Society and population: human migration, population and resources; Some current social problems: crime, deviance, juvenile delinquency, youth unrest; Technology and society: effects of technological factors on social life.

HUM 213 Government
2 hours in a week, 2.00 Cr.

Some basic concepts of government and politics; Functions, organs and forms of modern state and government; Socialism, Fascism, Marxism.
Government and politics of Bangladesh; Some major administrative systems of developed countries; Local self government; Some major aspects of international politics.

HUM 411 Business Law
2 hours in a week, 2.00 Cr.

Principles of law of contracts; Company law: law regarding formation, incorporation, management and winding up of companies; Labor law: law in relation to wages hours, health, safety and other condition to work; The trade union legislation arbitration, the policy of the state in relation to labor; The Factory Act (1965); The Law of compensation (1965).

IPE 493 Industrial Management
3 hours in a week, 3.00 Cr.

Introduction, evolution, management function, organization and environment.

Organization: Theory and structure; Coordination; Span of control; Authority delegation; Groups; Committee and task force; Manpower planning.

Personnel Management: Scope; Importance; Need hierarchy; Motivation; Job redesign; Leadership; Participative management; Training; Performance appraisal; Wages and incentives; Informal groups; Organizational change and conflict.

Cost and Financial Management: Elements of costs of products depreciation; Break-even analysis; Investment analysis; Benefit cost analysis.

Management Accounting: Cost planning and control; Budget and budgetary control; Development planning process.

Marketing Management: Concepts; Strategy; Sales promotion; Patent laws.

Technology Management: Management of innovation and changes; Technology life cycle; Case studies

CSE 400 Project and Thesis
6 hours in a week, 3.00 Cr.

Study of problems in the field of Computer Science and Engineering.

CSE 409 Computer Graphics
3 hours in a week, 3.00 Cr.

Graphics hardware: display devices, input devices etc; Basic raster graphics algorithms for drawing 2D primitives; Two-dimensional and three-dimensional viewing, clipping and transformations; Three-dimensional object representations: polygon surface, B-Spline curves and surfaces, BSP trees, Octrees, Fractal-Geometry methods; Visible surface detection methods: Z-buffer method, BSP tree method, Ray casting method; Illumination models; Surface rendering methods: polygon rendering, ray tracing, terrain visualization with height mapping, modeling surface details with texture mapping; Color models; Computer animation.

CSE 410 Computer Graphics Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 409.

HUM 275 Economics
2 hours in a week, 2.00 Cr.

Definition of Economics; Economics and engineering; Principles of economics.
Micro-Economics: Introduction to various economic systems – capitalist, command and mixed economy; Fundamental economic problems and the mechanism through which these problems are solved; Theory of demand and supply and their elasticities; Theory of consumer behavior; Cardinal and ordinal approaches of utility analysis; Price

determination; Nature of an economic theory; Applicability of economic theories to the problems of developing countries; Indifference curve techniques; Theory of production, production function, types of productivity; Rational region of production of an engineering firm; Concepts of market and market structure; Cost analysis and cost function; Small scale production and large scale production; Optimization; Theory of distribution; Use of derivative in economics: maximization and minimization of economic functions, relationship among total, marginal and average concepts.

Macro-economics: Savings; investment, employment; National income analysis; Inflation; Monetary policy; Fiscal policy and trade policy with reference to Bangladesh; Economics of development and planning.

HUM 371 Financial and Managerial Accounting
2 hours in a week, 2.00 Cr.

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.

CSE 451 Data Communication-II
3 hours in a week, 3.00 Cr.

Synchronous and asynchronous communications; Hardware interfaces, multiplexers, concentrators and buffers; Communication mediums and their characteristics; Data communication services: SMDS and ATM; Error control codes: linear block codes, cyclic codes, MLDC codes, convolution codes, Trellis code modulation; Digital switching: space and time division switching; Radio system design; Fiber optics communication: transmitter, receivers, network components, WDM; Line coding, trunks, multiplexing, switching, ATM switches; Satellite communications: frequency bands and

characteristics, types of satellites, transmission impairments, capacity allocation; Multiple access techniques.

CSE 452 Data Communication-II Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 451.

CSE 453 Wireless Networks
3 hours in a week, 3.00 Cr.

Cellular concepts: frequency reuse, handoff strategies, interference and system capacity, grade of service, improving capacity and coverage, call blocking probability; Propagation effects: outdoor propagation models, indoor propagation models, power control, Doppler's effect, small and large scale fades; Wireless LAN Technology; IEEE 802.11: standard, protocol architecture, physical layer and media access control; Mobile IP; Wireless Application Protocol; IEEE 802.16 Broadband Wireless Access; Brief review of 2nd and 3rd generation wireless: GSM, GPRS, CDMA; Cordless system; Wireless local loop; Bluetooth: overview and baseband specifications.

CSE 454 Wireless Networks Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 453.

CSE 461 Algorithm Engineering
3 hours in a week, 3.00 Cr.

Computational complexity, Parameterized complexity, Algorithms for combinatorial optimization, practical computing and heuristics, Approximation algorithms, LP based approximation algorithms, randomized algorithms, Experimental algorithmic, Algorithms in state-of-the-art fields like Bioinformatics, Grid Computing, VLSI design etc.

CSE 462 Algorithm Engineering Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 461.

CSE 463 Computational Geometry
3 hours in a week, 3.00 Cr.

Algorithm and complexity of fundamental geometric objects: polygon triangulations and art gallery theorem, polygon partitioning, convex hulls in 2-dimension.
Proximity: Voronoi diagrams and Delaunary triangulations.
Graph Drawing: drawing styles and applications, drawing of rooted trees, straight line drawing of planar graphs.

CSE 464 Computational Geometry Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 463.

CSE 471 Machine Learning
3 hours in a week, 3.00 Cr.

Introduction to machine learning; Learning algorithms: supervised, unsupervised, reinforcement, attribute based, neural network based, relational supervised and negative correlation; Genetic algorithm, genetic programming and evolutionary programming; Practical application of machine learning.

CSE 472 Machine Learning Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 471.

CSE 473 Pattern Recognition
3 hours in a week, 3.00 Cr.

Pattern Recognition: introduction, importance; Statistical and Neural Pattern Recognition: Bayesian classifier, Bayes decision theory, discriminant functions and decision surfaces; Bayesian classifier for normal distributions; Linear classifiers: discriminant functions and decision hyperplanes, Perceptron algorithm and its variants, Kessler's construction; Nonlinear classifiers: two and three layer perceptrons, backpropagation algorithm and its variants; Template matching: optimal path searching techniques, dynamic programming methods, correlation based matching and 2D log search algorithm for image matching; Context dependent classification: Viterbi algorithm, channel equalization, observable and hidden Markov models, three problems of HMM and their application in speech recognition; Syntactic Pattern Recognition: introduction to Syntactic Pattern Recognition, grammar-based approach, parsing, graph-based approach;

Unsupervised classification: basic concepts of clustering, proximity measures, categories of clustering algorithms, sequential clustering algorithms.

CSE 474 Pattern Recognition Sessional
3 hours in alternate week, 0.75 Cr.

Introduction to MATLAB; Laboratory works based on CSE 473 and using MATLAB: Bayesian classifier, linear classifier, nonlinear classifier, image matching, speech recognition, context dependent classification.

CSE 481 VLSI Design
3 hours in a week, 3.00 Cr.

VLSI design methodology: top-down design approach, technology trends and design automation algorithms; Introduction to CMOS inverters and basic gates; Brief overview of CMOS fabrication process: layout and design rules; Basic CMOS circuit characteristics and performance estimation; Buffer circuit design; Complex CMOS gates, CMOS building blocks: adder, multiplier; data path and memory structures.
Hardware modeling: hardware modeling languages, logic networks, state diagrams, data-flow and sequencing graphs, behavioral optimization.
Architectural Synthesis: circuit specification, strategies for architectural optimization, data-path synthesis, control unit synthesis and synthesis of pipelined circuits.
ASIC design using FPGA and PLDs

CSE 482 VLSI Design Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 481.

CSE 483 Computer Interfacing
3 hours in a week, 3.00 Cr.

Interfacing with floppy and hard-disk controller; serial communication interface; Barcode reader; Sound card; MIDI interface; Printer interface; ISA, PCI, AGP, PS/2 and USB interfaces; Interfacing with stepper motors, controlling semiconductor power switches – BJT, MOSFET, SCR and Triac, Application of Opto-coupler and relays, Embedded Processors, Embedded Computing Platform, Real Time Embedded Systems, Real Time Operating Systems, Embedded Systems Programming, Mapping between languages and hardware, Embedded Communication Systems, Embedded Computer Security.
CSE 484 Computer Interfacing Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 483.