

# CSE (Computer Science and Engineering)

## CSE 1101 Basics of Computers

The objective of this course is to teach fundamentals of computers, uses of computers, scope and advantages of computers and future of computer and information technology. The basic concepts of software and hardware, system software, application software and networking software will be covered. Students will also acquire knowledge on operating systems, graphics and presentation, and database management systems.

## CSE 1102 Programming Language and Application I

The course acquaints the students with the uses of computer with respect to programming languages and decision-making. It introduces the students to the concept of computer programming using C. The course includes problem analysis, programming algorithms, flow-chart construction and programming on diverse areas including structures, data types, arrays, pointers, lists, functions, etc., same touch on graphics etc.

## CSE 1102S Programming Language and Application I Sessional

Laboratory work based on CSE 1102.

## CSE 1103 Math I: Differential Calculus and Coordinate Geometry

Differential Calculus: Limit, Continuity and differentiability. Successive differentiation of various types of functions, Leibnitz's theorem, Rolle's theorem, Mean value theorems, Taylor's theorem infinite and infinite forms, Maclaurin's theorem infinite and infinite forms, Lagrange's form of remainders, Cauchy's form of remainder, Expansion of functions etc. Co-ordinate Geometry: Change of axes, Pair of straight-lines and System of circles.

## CSE 1206 Electrical Circuits

This covers the fundamentals of Electrical Engineering including measuring units, principles of D.C. voltage, current resistance and power, laws of electrical circuits, methods of network analysis, single-phase AC circuit analysis, and D.C. measuring apparatus. Laws of magnetic fields and methods of solving simple magnetic circuits will also be taught.

## CSE 1207 Physics

This course has been designed to help the students in learning techniques and acquiring the skills needed for Heat and Thermodynamics, Laws of Thermodynamics, Optics, Combination of Lenses, Theories of Light, Interference of Light, Diffraction of Light, Waves and Oscillations, Architectural Acoustics, Properties of Matter, Atomic Structure of Matter, Elasticity, Viscosity, Hydro-dynamics, Modern Physics, Relativity, Quantum effect, Mechanics, Radioactivity, Electricity and Magnetism, Electrostatics, Current Electricity, Electromagnetism, Magnetic Properties of Matter.

## CSE 1208 Programming Language and Application II

This course has been designed to provide an introduction of both structured and object-oriented programming techniques using the C++ Language. This will equip the students with solid foundation and understanding of the skills of Visual C++ language enabling them to undertake the programming tasks competently and independently. (Prerequisite: CSE 1102).

## CSE 1208S Programming Language and Application II Sessional

Laboratory work based on CSE 1208.

### CSE 2312 Object-Oriented Programming

The objective of this course is to acquaint students with OOP concepts, evolution and benefits. Based on the skills gathered on JAVA compiler the students will learn the programming technique using structured data types, arrays, pointers, lists, classes, objects, static and dynamic polymorphism, inheritance etc. Using the features of DDE and OLE the students will learn how to connect to a database performing queries, transaction processing and error handling. GUI design and file access is also covered in this module. (Prerequisite: CSE 1208).

### CSE 2312S Object-Oriented Programming Sessional

Laboratory work based on CSE 2312.

### CSE 2313 Discrete Mathematics

The course includes elements of Discrete Mathematics, Set theory, Elementary number theory, Graph theory, Generating functions, Algebraic structures, Semigraph, Permutation groups, Lattices, Finite fields and coding theory, Mathematical Logic, Propositional calculus and predicate calculus, theorem proof, relations, functions, introductory concept on digital logic, counting and advanced counting.

### CSE 2314 Math II: Integral Calculus and Differential Equations

Definition of integration, Integration by the method of substitution, Integration by parts, standard integrals, Definite integrals, Summing series. Wallis's formulae. Improper integrals, Beta and Gamma functions. Area under a plane curve in Cartesian and polar coordinates, Area of the region enclosed by two curves in Cartesian and polar coordinates. Ordinary differential equations, Degree and order of Ordinary differential equation. Formation of differential equations. Solutions of first order differential equations by various methods. Solutions of general linear equations of second and higher order with constant coefficient. Solution of homogeneous linear equations. (Prerequisite: CSE 1103).

### CSE 2315 Basic Electronics

The objectives of this course is to teach students introduction to Basic Electronics, Semiconductors, Junction diode characteristics, Bipolar transistor characteristics, Small Signal low frequency h-parameter model, Hybrid model, Amplifiers, the Darlington pair, Introduction to oscillators, differential amplifiers, operational amplifiers, Linear applications of OP Amps, gain, input and output impedance,  $\phi$ -set null adjustments, frequency response and noise. Introduction to JFET, MOSFET. PMOS, NMOS and CMOS; Biasing and application in switching circuits SCR, TRIAC, DIAC, UJT: Characteristics and applications. Introduction to rectifiers, active filters, regulated power Supply. Basic idea about IC fabrication techniques. (Prerequisite: CSE 1206).

### CSE 2315S Basic Electronics Sessional

Laboratory work based on CSE 1206 and CSE 2315.

### CSE 2417 Data Structure

Concepts and examples, elementary data objects, elementary data structures, arrays, lists, stacks, queues, graphs, trees, Memory management. Sorting and searching, hash techniques. (Prerequisite: CSE 1102).

### CSE 2417S Data Structure Sessional

Laboratory work based on CSE 2417.

#### CSE 2418 Design and Analysis of 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, graph algorithms, algebraic simplification and transformations, lower bound theory, NP-hard and NP-complete problems. (Prerequisite: CSE 2417).

#### CSE 2418S Design and Analysis of Algorithms Sessional

Laboratory work based on CSE 2418.

#### CSE 2419 Digital Logic Design

Number systems and codes. Digital logic: Boolean algebra, De-Morgan's law, 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. Combination circuit design. 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 ip- ops, race around problems,

Counters: asynchronous counters, synchronous counters and their PLA design. Synchronous and Moore machines. State minimization and assignments. Fundamental mode design A/D, D/A converters with applications. S/H circuits, LED, LCD and optically coupled oscillators. Nonlinear applications of OP Amps. Analog switches. (Prerequisite: CSE 2315)

#### CSE 2419S Digital Logic Design Sessional

Laboratory work based on CSE 2419.

#### CSE 2421 Math III: Complex Variables and Laplace Transforms

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 and Laurent's theorem. Singular points. Residue. Cauchy's Residue theorem. Evaluation of residues. Contour integration. Conformal mapping. 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. (Prerequisite: CSE 2314).

#### CSE 3523 Database Management Systems

The objective of this course is to acquaint the students with the concept of RDBMS. It will enable the students to acquire skills to use a leading Relational Database Management System for distributed on-line transaction processing applications through the usage of Oracle, SQL, Database Libraries, Visual Form/Menu Generators etc. (Prerequisite: CSE 1208)

#### CSE 3523S Database Management Systems Sessional

Laboratory work based on CSE 3523.

#### CSE 3524 Internet Programming

This course will acquaint the students with the most powerful and popular compiler used for the Internet-Java and will cover advanced programming concepts such as programming with pages, multi-platform programming, and net centric programming. Webpage development and HTML. (Prerequisite: CSE 2312)

#### CSE 3524S Internet Programming Sessional

Laboratory work based on CSE 3524.

#### CSE 3525 Data Communication

Fourier transforms. Modulation techniques-AM, FM, PM, OOK, FSK, PSK, QPSK, QAM. Pulse modulation-PCM, PPM, PAM, Delta modulation. Companding. Equalizers. Echo cancellation. Inter symbol, interference. TDM, FDM, Error due to noise. Concept of Channel coding and capacity. Voice Digitization. Speech redundancies. DPCM. Layered concept of computer network architecture. (Prerequisite: CSE 3527).

#### CSE 3526 Microprocessor, Interfacing and Low Level Programming

Introduction to different types of Microprocessor. Microprocessor architecture, instruction set, interfacing, I/O operation, Interrupt structure, DMA, Microprocessor interface ICs. Review of interfaces ICs. Bit slice Microprocessors, Advanced microprocessor, parallelism in Microprocessors. Concept of Micro-processor based systems design. Design of microprocessor and microcomputer hardware and software, use of microprocessor in the control of systems. Use of simulators, cross-compilers and development systems plus Low Level Programming. (Prerequisite: CSE 2419).

#### CSE 3526S Microprocessor, Interfacing and Low Level Programming Sessional

Laboratory work based on CSE 3526.

#### CSE 3527 Math IV: Linear Algebra, Fourier Transform and Statistics

Matrices: Definition of matrix, Different types of matrices. Algebra of matrices. adjoin and inverse of a matrix. Rank and elementary transformations of matrices. Normal and canonical forms. Solution of linear equations, Matrix polynomials. Eigenvalues and eigenvectors. Vectors: 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 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, Stroke's theorem, Greens theorem. Fourier Analysis: Real and complex form. Finite transform. Fourier integral. Fourier transforms and their uses in solving boundary value problems. Statistics: measures of central tendency, measures of dispersion. Probability distribution and their application in the management decision process: testing of hypothesis, regression, correlation, and introduction to non-parametric statistics, survey methods, sample design and sources and business statistics in Bangladesh. (Prerequisite: CSE 2314)

### CSE 3629 Computer Architecture

A functional description of computer hardware, hardware concept and current technology. An investigation of computer system design concepts including requirements, specifications, implementation and modification. Memories, buffers, CPU characteristics, performance factors, overlay, parallel and pipeline system, virtual memory organization; I/O systems. Interrupt mechanism; channels, control units; input devices including telecommunication equipment. (Prerequisite: CSE 3526).

### CSE 3630 System Analysis and Design

Analysis of Information, Information gathering and editing, feasibility study: operation, technical and economic feasibility, system design, tools and techniques, activity selections, Networks models, linear programming, project time estimation and minimization, cost/benefit analysis, input/output design, the design, database design, system implementation, project team selection, project maintenance, data mining techniques, telecommunications ethics, computer crime, security and control, documentation and report generation. (Prerequisite: CSE 3523)

### CSE 3630S System Analysis and Design Sessional

Laboratory work based on CSE 3630.

### CSE 3631 Operating Systems Design

Principles of operating systems; design objectives; sequential processes; concurrent processes, concurrency, functional mutual exclusion, processor cooperation and deadlocks, processor management. Control and scheduling of large information processing systems. Resource allocation, dispatching, processor access methods, job control languages. Memory management, memory addressing, paging and store multiplexing. Multiprocessing and time-sharing, batch processing. Scheduling algorithms, the systems, protection and security: design and implementation methodology, performance evaluation and case studies. Windows NT: covers in detail both the server and workstation aspects of Windows NT including features like administration and NT services. Multi-user Operating System Unix: covers Unix from two different aspects as an operating system and a programming language using shell scripts. It brings out the power and capability of Unix in managing programs, disks and other input/output devices. (Prerequisite: CSE 3629 Computer Architecture).

### CSE 3631S Operating Systems Design Sessional

Laboratory work based on CSE 3631.

### CSE 3632 Computer Peripherals, Interfacing and Maintenance

The objective of this course is to familiarize the students with how to detect practical problems in computer devices. It will impart the practical knowledge of how to diagnose and solve the problems of input devices, processors, cache, RAM, ROM, mother board, different types of cards, storage media, display unit, printer and other computer related equipment such as scanner OMR, bar code reader, UPS, stabilizer etc. Interface components and their characteristics. Optical displays and sensors. High power interface devices, transducers, stepper motors and peripheral devices. (Prerequisite: CSE 3629).

### CSE 3632S Computer Peripherals, Interfacing and Maintenance Sessional

Laboratory work based on CSE 3632.

### CSE 3635S Digital System Design Sessional

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 using special purpose controllers. (Pre-requisite: CSE 2419)

### CSE 4735 Compiler Construction

Introduction to compilers. Programming languages, data elements and structures, operators, assignment statements, parameter transmission, storage management. Finite automata and Lexical analysis. Syntactic specification of programming languages. Basic parsing techniques. Automatic construction of efficient parsers syntax directed translation, symbols, error detection and recovery, code optimization, loop optimization. Compiler projects. (Prerequisite: CSE 2312)

### CSE 4735S Compiler Construction Sessional

Laboratory work based on CSE 4735.

### CSE 4736 Computer Graphics

Introduction to Graphical data processing. Fundamentals of interactive graphics programming. Architecture of display devices and connectivity to computer. Implementation of graphics concepts of two-dimensional and three-dimensional viewing, clipping and transformations. Hidden line algorithms. Raster graphics concepts: Architecture, algorithms and other image synthesis methods. Design of inter-active graphic conversations. (Prerequisite: CSE 1102)

### CSE 4736S Computer Graphics Sessional

Laboratory work based on CSE 4736.

### CSE 4737 Software Engineering

This course covers concepts of software engineering such as requirements definition, modularity, structured design, data specifications, functional specifications, verification, documentation, software maintenance, software support tools, software project organization, quality assurance, and management and communication skills. The course introduces software engineering and quality assurance, covering the waterfall model and the various phases of analysis, design, coding, implementation, maintenance and management of software. (Prerequisites: CSE 2418 & CSE 3523)

### CSE 4737S Software Engineering Sessional

Software development using real life project, based on CSE 4737.

### CSE 4742 Digital Signal Processing

Applications and implementation of digital signal processing algorithms in areas such as multimedia and high speed networks, Topics include discrete time signals and systems; discrete time Fourier transforms and Z-transforms, discrete Fourier transforms and fast implementations, digital filter design and implementations, and multi-rate signal processing. Introduction to 2-dimensional signal processing, linear

prediction, adaptive filtering, and applications in speech and image processing. The course will make use of MATLAB in lab sessions. (Prerequisite: CSE 2314 & CSE 3525)

#### CSE 4840 Thesis and Project

In this course, the students will study the problem area, formulate the research problem, identify critical areas, conduct literature survey, study and analyze the problem for requirement definitions and design goals. The project may be hardware, software or a combination of both, or the students may opt for a research thesis. The students will propose a solution to the problem, then design, test, implement and study the performance of their proposed solution(s). Students will prepare a detailed report, for which they will be guided on international standards on scientific writing, including report organization, citations, references, figure placement, appendices, etc. The students will defend their project with a presentation before a panel of project examiners. (Prerequisite: CSE 3630)

#### CSE 4841 Computer Communication and Networks

The objective of this course is to develop the students' skill in computer networks (LAN). Types of networks, topology, network components including cabling, layered architecture and operations. TCP/IP as the worldwide standard for communication across different platforms, critical elements of TCP/IP including FTP and Telnet. Basic understanding of Modem, Repeaters, Bridges, Routers, Gateways and Telecommunications. Topological design and queuing models for network and distributed computing systems. Concept of managing network performance, Simple Network Management Protocol (SNMP), network data security.

#### CSE 4841S Computer Communication and Networks Sessional

Laboratory work based on CSE 4841.

#### CSE 4844 VLSI Design

Design and analysis techniques for VLSI circuits, Design of reliable VLSI circuits, noise consideration, design and operation of large fan out and fan in circuits, clocking methodologies, techniques for data path and data control design, Simulation techniques. This course will focus on the theoretical aspects of VLSI design. (Prerequisite: CSE 2315)

#### CSE 4844S VLSI Design Sessional

Laboratory work based on CSE 4844.

#### CSE 4845 Artificial Intelligence and Expert Systems

Survey of concepts in artificial intelligence, Knowledge representation, search and control techniques, Machines and features of the LISP and PROLOG languages, Problem representation; search, inference and learning in intelligent systems; systems for general problems solving, game playing, expert consultation, concept formation and natural language processing: recognition, understanding and translation. Expert systems case studies. (Prerequisites: CSE 1208, CSE 2313 & CSE 2418)

#### CSE 4845S Artificial Intelligence and Expert Systems Sessional

Laboratory work based on CSE 4845.

#### CSE 4846 Simulation, Modeling and Performance Analysis

Simulation methods, model building, statistical analysis of results, validation and verification techniques, digital simulation of continuous system, statistical models in simulation, queuing models, Markovian models, inventory Systems, random number and variate generation, simulation and analytical methods for computer systems and other practical problems, simulation packages, input data analysis, verification and validation of simulation models. (Prerequisite: CSE 3527)

#### CSE 4846S Simulation, Modeling and Performance Analysis Sessional

Laboratory work based on CSE 4846.

#### CSE 4848 Computer Security

Computer security concepts, protecting computing resources against external threats, access control methods, theory and techniques of cryptography and encryption algorithms, digital signatures and standards, hash functions, network security, computer software and hardware used in cryptography, Internet security. (Prerequisite: CSE 4841)

#### CSE 4851 Numerical Analysis

Solution of linear and non-linear equations, linear programming, approximations of functions, curve fitting, interpolation, extrapolation, integration, differentiation, solution of ordinary differential equations. This course offers laboratory practice and program implementation of various techniques of numerical methods. (Prerequisite: CSE 2314)

#### CSE 4854 Multimedia Theory

Overview to Multimedia Systems, Multimedia storage, Data compression techniques for audio and video, Synchronization, Multimedia networking and protocols, QoS principles, Video streams on ATM, Mobile multimedia communications, Operating system support for multimedia, Hypermedia system, Standard for Multimedia, Multimedia database and multimedia applications. (Prerequisite: CSE 3631)

#### CSE 4854S Multimedia Theory Sessional

Laboratory work based on CSE 4854.

#### CSE 4858 Theory of Computing

Finite Automata: Deterministic finite automata, Non-deterministic finite automata, Equivalence and conversion of deterministic and non-deterministic finite automata. Pushdown automata. Context Free Languages: Context free grammars. Turing Machines: Basic machines, Configuration, Computing with Turing machines, Combining Turing machines. (Prerequisite: CSE 2313)



## CSE 4871 Pattern Recognition

Introduction to pattern recognition, classification, and description. Patterns and Feature extraction. PR approaches, Training and Learning in PR, Common Recognition Problems. Statistical PR, The Gaussian case and class dependence, Discriminant Function, classifier performance, Risk and Errors. Supervised Learning, Parametric Estimation and Supervised learning, Maximum likely hood estimation, The Bayesian Parameter Estimation Approach. Supervised Learning Using Non parametric Approaches, Parzen windows. Linear Discriminant Function and the Discrete and Binary Feature cases, Unsupervised Learning and clustering, Syntactic Pattern Recognition (SPR), Syntactic Pattern Recognition via parsing and other grammars, Graphical approaches to Syntactic Pattern Recognition, Graph based structural presentation, graph Isomorphism, similarity measurements, Learning via grammatical Inference. Introduction to Neural Recognition and Neural Pattern associators and matrix approaches. (Prerequisite: CSE 3527)

## CSE 4871S Pattern Recognition Sessional

Laboratory work based on CSE 4871.

## CSE 4872 Distributed Systems

High-performance computing; parallel computing; distributed computing; grid computing; distributed computing middleware; cluster computing; metacomputing environments; applications and motivation; supercomputer architectures; programming tools; pro ling and performance measurement; case studies. (Prerequisites: CSE 1208 & CSE 3629)

## CSE 4872S Distributed Systems Sessional

Laboratory work based on CSE 4872.

## CSE 4873 Digital Image Processing

Introduction to digital image, Image le format, types of digital images, PPM, BMP, GIF and JPG le formats. Image Compression: types; techniques. Image enhancement: contrast enhancement, image sharpening, Edge detection: using convolution techniques. Mathematical morphology: image segmentation; edge detection, other applications. (Prerequisite: CSE 2421)

## CSE 4873S Digital Image Processing Sessional

Laboratory work based on CSE 4873.

## CSE 5004 Fundamentals of Computer

The objective of this course is to teach fundamentals of computers, classification of computers, use of computers, scope and advantage of computers, and the future of the computer information technology. Basic concepts of system software and application software are covered. Ideas are given about input hardware, processing hardware, storage hardware, output hardware and networks. Practical knowledge on word processing, electronics spreadsheet, graphical presentation and database packages is provided.