6.0 Contents
6.1 Humanities and Business Courses

ENG113 Basic Functional English and English Spoken: This course is designed to develop and improve the learning of English grammar and composition, which the fresher of the first semester have previously gone through in their secondary and higher secondary levels. The course aims to enhance the ability of the students to construct grammatically correct and meaningfully complete sentences and improve their basic skills of English language so that they can read, write and speak correctly. This course covers mainly the following areas: Pronunciation, Vocabulary building, Sentence construction, Subject verb agreement, Tenses, Prepositions, Voice, Articles, Common mistakes in everyday English, Paragraph writing, Story writing, Reading comprehension, Spoken English. [Prerequisite: None].

ENG123 Writing and Comprehension: This is a continuation of ENG101 and addresses the skills of writing, speaking, reading and listening. Students have already finished ENG101 that provided them with the fundamental concepts of English language. This course will emphasize on analytical reading and writing and techniques of effective speaking, and listening at interpersonal and organizational setting. The course covers mainly the following areas: Letter writing, Report writing, Essay writing, Dialogue writing, Analytical writing, Amplification writing, Reading comprehension; Narrating stories and events, Giving opinions in discussions, Participating in debate; Listening to recorded conversation/speech inside classroom. [Prerequisite: ENG 101].

ECO314 Economics: Micro-Economics: Introduction to various economic systems – capitalist, communist 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 behaviour; 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. [Prerequisite: None].

GED201 Bangladesh Studies: Origin of the name of Bangladesh, Bangla Language and People of Bangladesh; History of Bengal: The Ancient Age up to 1204 A.D; History of Bengal: The Medieval Age up to 1757 A.D.; History of Bengal: The Modern Age up to 1947 A.D.; Background of Bangladesh (Language movement; Twenty one point programme, Discrimination against East Pakistan, Six-point programme and Liberation War of Bangladesh); Modern: Organs of the Government of Bangladesh (Legislature, Executive and Judiciary); Constitution of Bangladesh; Local Government and Administration of Bangladesh; Industrial Sector: Telecommunication, Jute & RMG ; Agriculture of Bangladesh; Energy Sector in Bangladesh; Economy of Bangladesh (Planning and Budget); Education of Bangladesh; Foreign Policy of Bangladesh; Climate Change and Environmental degradations; Human Resource Development; Infrastructure or Transportation and Communication; Service Sector: Public and Private; Art and Culture of Bangladesh; Ethnic Politics: The Case of CHT. [Prerequisite: ENG102].

GED321 Art of Living: This course will make an attempt to enhance student’s ability to perform various activities of life positively and effectively - activities relating to personal, family, and professional arenas. This course will include topics on contemporary knowledge and skills needed for effective living. Besides this, student’s are expected to accomplish competency to cope with the rapid changing world by acquiring ICT based knowledge and skill of the 21st Century. The course is also expected to help students in becoming a useful and effective human being for the community and the country.


To be more specific, in this course, an attempt will be made to develop critical thinking, creativity, spirituality & a productive mind-set. Also an endeavor will be made to improve personal effectiveness through art of conversation, good communication skill, good decision making, effective goal setting, Impression management and self discipline. Further, the course will aim at training students for more effective accomplishment of goals that serve their mission well. Since we are living in the knowledge based society now, everybody must acquire necessary skills & knowledge to be a productive citizen in the 21st century. Due attention will be given for training students in this direction [Prerequisite: NONE].
6.2 Mathematics and General Science Courses

MAT111 Differential and Integral Calculus: Differential Calculus: Function; Limit; Continuity and Differentiability; Differentiation of various types of functions with basic concept; Successive differentiations of various types of functions; Leibnitz’s theorem; General theorem and expansions (a) Rolle’s theorem (b) Mean value theorem (c) Taylor’s and Maclaurin’s theorem in finite and infinite forms (d) Lagrange’s form of remainders (e) Cauchy’s form of remainders (f) Expansions of functions; Evaluation of Indeterminate forms (L’ Hospital’s rule) ; Partial differentiation of various types of functions; Maxima and Minima; Concavity; Tangent and Normal; Asymptotes, Integral Calculus: Indefinite Integral; Concept on Integration; Fundamental Integration; Method of Substitution; Integration by parts; Integration of rational fraction; Reduction of Order; Integration of special Trigonometric Function, Definite integral: General Properties of definite integral (a) Gamma and Beta Function; Definite Integral as the Limit of a Sum; Improper Integrals: (a) Gamma and Beta Function; Laplace’s Transforms (introduction); Multiple Integrals; Area; Volume. [Prerequisite: None].

MAT121 Complex Variable, Linear Algebra and Co-ordinates Geometry: Complex Variable: Complex number; Complex equations ( More emphasis on Geometry of the equations); Analytic Functions of complex variable: Differentiability of Complex function, Laplace’s equation, Harmonic Function, Cauchy-Riemann Equations, Determination of Conjugate function, Construction of Analytic Function(Milne Thomson Method), Laplace equation in Polar form; Complex Integration: Cauchy Integral Formula; Liouville’s theorem; Taylor’s and Laurent’s theorem; Singular points; Residue theorem, Linear Algebra: Solutions of the System Linear equation; Matrix; Solution of simultaneous equation using Matrix operation; Vector Space; Linear dependence & independence; Basis and Dimension; Linear Transformation; Inner product space; Normalization(Gram-Schmidt orthogonalization); Eigenvalue and Eigenvectors; Quadratic Forms; Hermitian Forms, Coordinate Geometry: Change of axes; Direction Cosines and projections; Pair of Straight line & 2nd Degree General Equation; Shortest Distance; Coordinates of a point in space in different systems; Plane; Quadratics. [Prerequisite: MAT111].

MAT131 Ordinary and Partial Differential Equation: Ordinary Differential Equation: Formation of Differential Equation; First order and first degree differential equation, Separation of Variables, Homogenous equation, Equation reducible to homogenous, Exact equation, Linear Equation, Reducible to Linear Equation; First Order but Higher Degree Differential Equation: Solvable for P; Solvable for y; Solvable for x; Clairaut’s Equation; Lagrange’s Equation; Linear Differential Equation with Constant Coefficients; Linear Differential Equation with right hand side non zero; Variation of parameter; Method of Successive approximation (Picads method); Reduction of Order; Method of undermined Coefficient; Matrix method; Series Solution; Various types of Application of Differential Equations; Partial Differential Equation: Formation of Partial Differential equation, Linear and Non-Linear first order equation, Standard forms, Linear Equation of higher order, Equation of second order with variable coefficients, Wave & Heat equations, Particular solution with boundary and initial conditions. [Prerequisite: MAT121].

**STA133 Statistics and Probability:** Introduction: Statistics; Type of Statistics; Types of Variable; Levels of Measurement; Graphical representation of data: Frequency Distribution; Construction of a Frequency Distribution; Graphical presentation of Frequency Distribution (Histogram, Frequency Polygon, Cumulative Frequency Polygon, Line Chart, Bar Chart, Pie Chart); Measure of Central Tendency: Mean; Median; Mode; Weighted mean; Geometric Mean; Relative Positions of the Mean; Median; Mode; Measures of Dispersion: Range; Mean Deviation; Variance; Standard Deviation; Relative Dispersion; Skewness; Kurtosis; Correlation: Relationships among the coefficient of correlation; the coefficient of determination; and the standard Error of Estimate; Regression Analysis: Least Squares Principle; Drawing the Line of Regression; Standard Error of Estimate; Assumptions Underlying Linear Regression; Probability Distribution: The mean; Variance and Standard Deviation of a Probability Distribution; Binomial Probability Distribution; Poisson Probability Distribution; Estimation: Basic concept of Estimation; Point estimates and confidence intervals; Hypothesis: Basic concept of Hypothesis; Testing a hypothesis; Testing for a population with a known population standard deviation; Testing for a population mean: large sample, population standard deviation unknown. [Prerequisite: MAT112].


**PHY123 Electricity, Magnetism and Modern Physics:** Electricity and Magnetism: Electric charge, Coulomb's Law, Application of Coulomb’s law, Electric field, Calculation of electric field, a dipole in an electric field, Electric flux, Gauss' law, Electric potential and Electric potential energy; Capacitor and Capacitance, Combination of capacitors, Energy stored in a capacitor, Energy density, Dielectrics; Current Electricity, Electric current. Ohm's Law, Resistance and Conductance, DC circuits, Kirchhoff's laws, RC circuits; Magnetic field, Force on current carrying conductors in a magnetic field, Motion of a point charge in a magnetic field, Hall effect, Biot-Savart law, Ampere's law, Faraday's law, Motional emf, Lenz’s law, Self inductance and mutual inductance, Energy stored in a magnetic field, Modern Physics: Electromagnetic waves, light, X-rays and Interaction with matter, (photoelectric effect, Compton effect, pair production), characteristic x-rays, X-ray diffraction, Bragg’s law and crystal structure, applications of X-rays; Atomic structure: Atomic model, The Rutherford-Bohr model, Electron orbits, Atomic spectra, The Bohr atom model, Energy levels and spectra, Atomic excitation, Laser; Nuclear composition, nuclear forces, Isotopes, isobars and isotones, stable nuclei, Radioactivity and radioactive decay, decay constant, half life, mean life, alpha, beta and gamma decay and Radioisotopes and their applications; Nuclear reactions, Fission, Fusion and Nuclear Reactor. [Prerequisite: PHY114].
PHY124: Physics – II Lab.
Laboratory work is based on the courses of PHY 114 and PHY 123.

6.3 Core Courses

CSE112 Computer Fundamentals: The main objective of this course is to familiarize the students with computers and their applications in professional tasks. The course includes hardware and software concepts, functions of CPU, memory, and I/O devices. Functions of operating system, introduction to some commonly used operating systems, DOS and Windows environment. Concepts of database, Networking and Internet applications. Application packages (MS Words, MS Excel and MS Access). Basic ideas about programming and some high level programming languages. [Prerequisite: None]

CSE122 Programming and Problem Solving: Programming Concepts: Programming languages, Language processors, Problem solving with computer - problem definitions, analysis, algorithms, flowcharts, pseudo code, coding, running the programs, debugging, testing, documentations. C Programming Language: Overview of C; C fundamentals; Operators and expressions; Data input and output; Control statements; Program structure - storage classes, automatic variables, external (global) variables, static variables, multife program, Character strings; Arrays; Functions; Structures and unions; Pointers; Data files; Additional features of C - enumerations, commend line parameters, macros, C pre-processor; Programming contest; ACM problem analysis and solving. [Prerequisite: CSE 112]

CSE123 Programming and Problem Solving Lab:
Laboratory work is based on the course CSE122.

CSE131 Discrete Mathematics: Propositional calculus and Predicate calculus; Mathematical reasoning: induction, contradiction and recursion; Set theory; Relations; Functions; Graph theory; Counting: Permutation and Combination, Principles of inclusion and exclusion; Generating functions and recurrence relations; Algebraic structures: rings and groups. [Prerequisite: None]

CSE132 Electrical Circuits: Fundamental electrical concepts and measuring units, DC voltage, current resistance and power, Laws of electrical circuits and methods of network analysis, Principles of DC measuring apparatus. Alternating current- instantaneous and r.m.s current, voltage and power, average power, average power for various combinations of R, L and C circuits, Phasor representation of sinusoidal quantities. [Prerequisite: PHY123].

CSE133 Electrical Circuits Lab:
Laboratory work is based on the course CSE132.

CSE134 Data Structures: Introduction: data structures, data structure operations, mathematical notations and functions, String Processing: basic terminology, strong strings, character data types, string operations, word processing; Linear Data Structures: arrays, records, pointers, linked lists, stacks, recursions, queues and their applications; Nonlinear Data Structures: trees, graphs and their applications; Sorting, Searching and Hashing. [Prerequisite: CSE122].

CSE135 Data Structures Lab:
Laboratory work is based on the course CSE 134.

CSE212 Digital Electronics: 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; Sequential circuits: Flip-flops; Counters: asynchronous counters, synchronous counters and their applications; Synchronous and asynchronous logic design; PLA design. [Prerequisite: CSE132]

CSE213 Digital Electronics Lab:
Laboratory work is based on the course CSE 212.

CSE214 Object Oriented Programming: Philosophy of Object Oriented Programming (OOP); Advantages of OOP over structured programming; Encapsulation; Classes and objects; Access specifics; 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. Memory models, the message based philosophy. Reference languages: C# / C++ / Java. [Prerequisite: CSE 122].

CSE215 Object Oriented Programming Lab:
Laboratory work is based on the course CSE 214.

CSE221 Algorithms: Introduction: algorithm specification, performance analysis; Elementary Data Structures: sets and disjoint set union; Divide-and-Conquer: convex hull; The Greedy Method: knapsack problem, tree vertex splitting, job sequencing with deadlines, minimum-cost spanning trees, optimal storage on tapes, single-source shortest paths; Dynamic Programming: multistage graphs, all pairs shortest paths, the traveling salesperson problem, flow shop scheduling; Basic Traversal and Search Techniques: BFS and DFS, connected components and spanning trees, bi-connected components and BFS; Backtracking: The 8-queens problem, graph coloring, Hamiltonian cycles; Branch and Bound: Least Cost (LC) search, The 15-puzzle, bounding; Flow Algorithms; Number Theoretic Algorithms. [Prerequisite: CSE 134].

CSE222 Algorithms Lab:
Laboratory work is based on the course CSE 221.

CSE224 Electronic Devices and Circuits: Semiconductors, Junction diode characteristics, Bipolar Transistor: Characteristics, small signal low frequency h-parameter model, hybrid-pi model, Amplifiers: voltage and current amplifiers, Oscillators. Differential amplifiers, Operational Amplifiers, linear applications of op-amps, gain, input and output independence, off-set null adjustments, frequency response and noise. Introduction to JFET, MOSFET, PMOS, NMOS and CMOS: biasing and applications in switching circuits. SCR, TRIAC, DIAC, UJT: characteristics and applications. Introduction to rectifiers, active filters, regulated power supply. [Prerequisite: CSE 132].

CSE225 Electronic Devices and Circuits Lab:
Laboratory work is based on the course CSE 224.

CSE231 Microprocessor and Assembly Language: Introduction to the internal working of computers; microprocessor basics; Assembly Language of 8086, 80386, 80486 and Pentium microprocessors; Machine and Assembly instruction types and character representation instructions; Interface between the computer and the outside world, including laboratory applications, Instruction execution; programming I/O devices: interrupt service routines; Machine language programming; Instruction sets and their implementation. The assembly process; addressing methods; subroutines; macros; files; interrupt and concurrent process. Practical labs will be conducted based on theory taught. [Prerequisite: CSE 132/ CSE 212]
CSE232 Microprocessor and Assembly Language Lab: Laboratory work is based on the course 231.

CSE233 Data communication: Principles of analog and digital data transmission, data and signal, transmission impairments, concepts of channel capacity and coding, data encoding and modulation: ASK, FSK, PSK, QPSK, pulse code modulation, delta modulation and quantization. Asynchronous and synchronous transmission, data communication interfaces, Data link Control: Error and Flow control: CRC, Hamming codes, Sliding window, different ARQs, Multiplexing: FDM, TDM, and CDM, xDSL. [Prerequisite: CSE212].


CSE235 Introduction to Bio-Informatics: Introduction to Bioinformatics, which uses computer databases to store, retrieve and assist in understanding biological information. Genome-scale sequencing projects have led to an explosion of genetic sequences available for automated analysis. These gene sequences are the codes, which direct the production of proteins that in turn regulate all life processes. The student will be shown how these sequences can lead to a much fuller understanding of many biological processes allowing pharmaceutical and biotechnology companies to determine for example new drug targets or to predict if particular drugs are applicable to all patients. Students will be introduced to the basic concepts behind Bioinformatics and Computational Biology tools. [Prerequisite: CSE213]

CSE311 Database Management System: Introduction: purpose of DBMS, view of data, data models, database languages, transaction management, database users, overall system structure; Entity-Relationship Model: design issues, mapping constraints, keys, ER diagram, extended ER features; Relational Model/SQL: basic structures, set operations, aggregate functions, nested subqueries, derived relations, views, modification of database, joined relations, data-definition language, embedded SQL; Integrity Constraints: domain constraints, referential integrity, assertions, triggers; Relational Database Design: pitfalls in relational-database design, decomposition, normalization; Object-Relational Databases: complex types and object orientation, querying with complex types, creation of complex values and objects; Storage and File Structure: file organization, organization of records in files, data-dictionary storage, storage structures for object-oriented databases; Indexing and Hashing: ordered indices, B²-tree index files, B-tree index files, static hashing, dynamic hashing, index definition in SQL, multiple-key access. [Prerequisite: CSE 134 > CSE 222].

CSE312 Database Management System Lab: Laboratory work is based on the course CSE 311.

applications, e-mail and file transfer SMTP and FTP, HTTP and World Wide Web. Virtual circuit
switching, Frame Relay and ATM, congestion control and quality of service in Frame Relay and ATM.
[Prerequisite: CSE213].

CSE314 Computer Networks Lab:
Laboratory work is based on the course CSE313.

CSE321 System Analysis and Design: Different types of information; Qualities of information; Analysis
of information requirements for modern organizations; Role, tasks and attributes of a Systems Analyst;
Sources of information; Information gathering techniques; Editing; Handling of missing information;
Requirements specifications; Steps of systems analysis; Concepts of feasibility analysis; Analysis of
technical facilities; Cost-benefit analysis; Design of an information system; Designing of inputs and
outputs; Hardware and software analysis; Telecommunications requirements analysis;; Database and files
design; Project management and documentation; Analysis of system maintenance and upgrading; Ethics
and privacy; Control and security; Project team organization. [Prerequisite: CSE311].

CSE322 Computer Architecture and Organization: The evolution of computers, CPU Performance
measurement, Data representation, various elements of computer design: CPU organization: RISC and
CISC – instructions sets, addressing modes. Data path Design: fixed and floating point arithmetic,
Combinational and sequential ALU design, pipelined adder, multiplier, systolic arrays. Control Design:
Hardwired and Micro-programmed control, Pipeline control. Memory Organization: multilevel memories,
address translation, Cache memory — address mapping. System Organization: I/O control, Bus control.
[Prerequisite: CSE232].

CSE323 Operating Systems: 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;
Process synchronization, Deadlock: resource allocation and deadlock, deadlock detection, prevention and
recovery; Memory management: swapping, paging, segmentation, virtual memory; Input/Output:
hardware, drivers, disks, disk scheduling, terminals, clocks; File Systems: files, directories, security,
protection; Case study of some operating systems. [Prerequisite: CSE 213 > CSE 231].

CSE324 Operating Systems Lab:
Laboratory work is based on the course CSE 323.

CSE331 Compiler Design: Language theory; Finite automata: deterministic finite automata,
nondeterministic finite automata, equivalence and conversion of deterministic and nondeterministic finite
automata, pushdown automata; 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. [Prerequisite: CSE 213 > CSE 221].

CSE332 Compiler Design with Lab:
Laboratory work is based on the course CSE 331.

CSE333 Software Engineering: Follows the software life cycle from the requirement, specification, and
design phases through the construction of actual software. Topics include management of programming
teams, programming methodologies: Object Oriented Development: Object modeling, Dynamic
modeling, Functional modeling; data flow diagram, operation specifying, constraints specifying; Object
design: optimization, representation and documentation; Implementation of a designed object in
programming languages and databases; Programming style: object oriented style, reusability,
extensibility, robustness; debugging aids, documentation, evaluation and measurement of software,
verification and testing techniques, and the problems of maintenance, modification, and portability. The course also includes a project work assigned by the course teacher. [Prerequisite: CSE 222].

**CSE334 Wireless Programming:** Fundamentals of modern wireless systems; Fundamentals of radio propagation and link performance; Cellular concept: interference, base stations and cell sites, handoffs, system capacity; Basic concept of telecomm network and wireless programming, The J2ME architecture, CDLC and KVM, The connected and limited devices configuration, Mobile information device profile, MIDP Programming, Low level user interface API, Event handling, Record management system, Network management, Using push registry in J2ME, SMS programming, .Net framework for wireless programming, Bluetooth and IrDA Communication, Programming PDA. [Prerequisite: CSE 222>CSE233]

**CSE412 Artificial Intelligence:** Introductory concept of artificial intelligence; Knowledge representation; Propositional logic, inference technique—resolution; Frame problem; Search techniques in AI; Planning; Probabilistic reasoning; AI machines and Features of LISP and PROLOG languages; Learning in symbolic and non-symbolic representation; Learning with decision trees, Reinforcement learning, Natural language processing, Study of expert systems such as robotics and understanding. [Prerequisite: CSE 131 > CSE 213].

**CSE413 Artificial Intelligence Lab:**
Laboratory work is based on the course CSE 412.

**CSE414 Simulation and Modeling:** Simulation modeling basics: systems, models and simulation, classification of simulation models, steps in simulation study, concepts in discrete event simulation, event scheduling and process interaction approaches, time advance mechanism, organization of a discrete event simulation model, continuous simulation models, combined discrete continuous models, Monte-Carlo simulation, simulation of queuing systems. Building credible and credible simulation models: validation principles and techniques, statistical procedures for comparing real world observations and simulation outputs, input modeling, generating random numbers and random vitiates, output analysis. Simulation languages: analysis and modeling of some practical systems. [Prerequisite: CSE213]

**CSE415 Simulation and Modeling Lab:**
Laboratory work is based on the course CSE 414

**CSE417 Web Engineering:** Introduction to web programming concepts, HTML, DHTML, XHTML and XML, Cascading style sheets. Dynamic documents with JavaScript. Introduction to client-side and server-side programming using PHP, client server architecture, database access through web. Web-based applications are developed with emphasis on accessing database servers. The course includes lab works based on theory taught. [Prerequisite: CSE122 > CSE222]

**CSE418 Web Engineering Lab**
Laboratory work is based on the course CSE417.

**CSE421 Computer Graphics:** An introduction to computer graphics hardware, algorithms, and software. Line generators, affine transformations, line and polygon clipping, splines, interactive techniques, perspective projection, solid modeling, hidden surface algorithms, lighting models, shading, and animation. Substantial programming experience is required. [Prerequisite: MAT 211 > CSE 213 > CSE 222].

**CSE422 Computer Graphics Lab:**
Laboratory work is based on the course CSE421.
CSE423 Embedded Systems: Characteristics and design of embedded systems; Formal models and specification languages for capturing system behavior; Techniques for specification, exploration and refinement; Interfacing of devices, System partitioning and hardware/software co-design; Tools for validation, verification, and simulation; Quality and performance metrics. [Prerequisite: CSE232]


CSE 499 Project / Internship: The student undertake project/internship in a specific area of interest and accomplish through research, development, report and presentations.

6.3 Elective Courses

CSE432 Cryptography and Network Security: Introduction and course overview; overview of security; introduction to cryptography; some simple schemes for private-key encryption, and why they are insecure; security notions for private-key encryption; private-key encryption schemes, modes of encryption; basic number theory, public-key encryption, RSA, Diffie-Hellman; generating random primes, El Gamal encryption, hybrid encryption; message integrity, message authentication codes, signature schemes; hash functions, KDC, PKI: certification authorities(CA), revocation; Email-security :confidentiality, integrity; integrity policies, representing identity, anonymity and pseudonymity, anonymizers Web issues: SSL, computer viruses/worms; cookies, attacks, defenses, and principles. IPsec: Encryption and Authentication. [Prerequisite: CSE313]

CSE433 Digital Image Processing: Introduction; Digital Image Fundamentals; Image Transformation; Image Enhancement; Image Restoration; Image Compression; Image Segmentation; Representation and Description; Recognition and Interpretation. [Prerequisite: CSE133>MAT221]

CSE434 Advanced Database Management System: Oracle: Introduction to RDMS. Interactive SQL - Invoking SQL *PLUS; Data Manipulation in DBMS; The Oracle data types; Two dimension matrix creation; Insertion of data into tables; Updating the contents of a table; Deletion operations; The many faces of the select command; Modifying the structure of tables; Removing/deleting/dropping tables; Data constraints; Computations in expression lists used to select data; Logical operations; Range searching; Pattern matching; Oracle functions; Grouping data form tables in SQL; Manipulating dates in SQL; Joins; Constructing an English sentence with data form table columns; Subqueries; Using the union, intersect and minus clause; Indexes; Views; Sequences; Granting permissions; Revoking the permissions given; Creation of reports in SQL *PLUS; PL/SQL - Introduction to PL/SQL; The PL/SQL execution environment; The PL/SQL syntax; Understanding the PL/SQL block structure; Oracle transactions; Concurrency control in Oracle; Locks; Cursors; Stored procedures; Stored functions; Database triggers. [Prerequisite: CSE311]

CSE435 Distributed Systems: Introduction to distributed systems: Message passing, RPC, DSM: Consistency models. Synchronization: Clock synchronization, Event ordering, Mutual exclusion, Deadlock, Election algorithms, Task Assignment: load sharing and balancing, process migration, Distributed file systems, Case study of Distributed OS. [Prerequisite: CSE313]

CSE436 Parallel Processing: Introduction; Von Neumann Model; Need of Parallel Processing; Flynn’s Classifications; Shared Memory Model; Network Based Models; Simulations; Parallel Algorithms; Measures of Complexities; Algorithms for various parallel models such as Finding Summation; Finding
Minimum, Maximum; Sorting; Searching; Selection; Graph Theoretical Problems; Combinatorial Problems; Matrix Transpose; Matrix Multiplication; Solution of simultaneous Linear Equations etc. [Prerequisite: CSE322]

**CSE437 VLSI Design and Testing:** VLSI design methodology: top-down design approach, technology trends. NMOS, CMOS inverters, pass transistor and pass gates: dc and transient characteristics. Brief overview of fabrication process: NMOS, CMOS, Bi-CMOS process. NMOS and CMOS layout, stick diagram and design rules. CMOS circuit characteristics and performance estimation: resistance and capacitance rise and fall time, power estimation, Buffer circuit design, Introduction to Bi-CMOS circuits. Complex CMOS gates, CMOS building block: multiplexer, barrel shifter, adder, counter, multipliers, Data Path and memory structures. Design style: FPGA and PLDs. Introduction to HDL: basic digital design using VHDL. [Prerequisite: CSE 322].

**CSE438 Digital Electronics and Pulse Techniques:** 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, PLA’s; 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. [Prerequisite: CSE224].

**CSE439 Multimedia Systems Development:** The course aims at creating foundation knowledge in Multimedia computing and Internet technology, and their applicability in the business environment. It introduces hand-on experience in the use of state-of-the-art techniques and professional tools for the creation of multimedia business and training applications. The course attempts to unveil the mystery of multimedia. The tools of information technology available for the production of multimedia systems are undergoing continual changes. The course provides an introduction to the tools currently available to incorporate video, audio and other media components to allow students gain an understanding of the effective use of multimedia. [Prerequisite: CSE122]

**CSE440 Fault Tolerant Systems:** 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. [Prerequisite: None]

**CSE441 Multi-Core Programming:** Elements of parallel programming and multi-threading ;Programming with threading APIs;OpenMP*: The portable solution; Solutions to common parallel programming problems ; Debugging and testing multi-threaded applications ;Software development tools for multi-threading. [Prerequisite: CSE122>CSE222]

**CSE442 Software Development:** Students will develop large application/ database/ Internet software(s) with proper documentation as assigned by teacher. [Prerequisite: None]


**CSE445 Application Design and Development:** This module gives an overview of some of the different tiered application architectures (1, 2, 3, N tiers) and some sample designs. The course teaches
some of the foundation skills required for building medium to large scale web-based applications, with a
B2B e-commerce focus. The course introduces J2EE and Microsoft .NET as two technology architectures
for implementing enterprise applications. Java Servlets and Java Server Pages (JSP), Java application
servers, integration of data from multiple data sources and distribution of business logic in component-
based applications. Multiple application-end delivery formats are considered including web browsers and
WAP phones. [Prerequisite: CSE332]

CSE446 Data Mining: An introduction to data mining; Data preparation, model building, and data
mining techniques such as clustering, decisions trees and neural networks; Induction of predictive models
from data: classification, regression, and probability estimation; Application case studies; Data-mining
software tools review and comparison. [Prerequisite: CSE311]

Statistical pattern recognition. Supervised learning using parametric and non-parametric approaches.
Linear discriminate functions and the discrete and binary feature cases. Unsupervised learning and
clustering. Syntactic Pattern Recognition: Syntactic recognition via parsing and other grammars,
graphical approach to syntactic pattern recognition, learning via grammatical inference. Neural Pattern
Recognition: Neural pattern associators and matrix approaches, unsupervised learning in neural pattern
recognition. [Prerequisite: MAT221]