Bachelor of Science (Engineering) in Computer Science and Engineering

(B.Sc. (Engineering) in CSE)

Effective from: 2004-2016

Course Curriculum

Level 1 Semester I

Sl. No.	New Course Code	Old Course Code	Course Title	Credit	Hour(s) per Week
1	CSE 101	CIT 101	Structured Programming Language	3.00	3.00
2	CSE 102	CIT 102	Structured Programming Language Sessional	1.50	3.00
3		MAP 101	Mathematics-1 (Differential Calculus and Coordinate Geometry)	3.00	3.00
4		MAP 103	Physics 1 (Mechanics, waves and optics)	3.00	3.00
5		MAP 104	Physics 1 Sessional	0.75	1.50
6		AIE 105	Basic Mechanical Engineering	3.00	3.00
8		SSL 101	English	3.00	3.00
			Total	17.25	19.50

Level 1 Semester II

Sl. No.	New Course Code	Old Course Code	Course Title	Credit	Hour(s) per Week
1	CSE 151	CIT 103	Object Oriented Programming	2.00	2.00
2	CSE 152	CIT 104	Object Oriented Programming Sessional	1.50	3.00
3	CSE 153	CEN 101	Discrete Mathematics	3.00	3.00
4		EEE 101	Introduction to Electrical Engineering	3.00	3.00
5		EEE 102	Introduction to Electrical Engineering Sessional	1.50	3.00
6		MAP 105	Mathematics- II (Integral Calculus and Ordinary and Partial Differential Equations)	3.00	3.00
7		MAP 107	Physics II (Electricity, Magnetism and Modern Physics)	3.00	3.00
8		MAP 108	Physics II Sessional	0.75	1.50
9		AIE 106	Engineering Drawing and Auto CAD Sessional	1.50	3.00
10			Option I	2.00	2.00
			Total	21.25	26.50

Option I

Sl. No.	Course Code	Course Title	Credit	Hour(s) per Week
1	SSL 103	Sociology	2.00	2.00
2	SSL 105	Government	2.00	2.00
3	MGT 105	Business Law	2.00	2.00

Level 2 Semester I

Sl. No.	New Course Code	Old Course Code	Course Title	Credit	Hour(s) per Week
1	CSE 201	CIT 201	Data Structures	3.00	3.00
2	CSE 202	CIT 202	Data Structures Sessional	0.75	1.50
3	CSE 203	CEN 201	Digital Logic Design	3.00	3.00
4	CSE 204	CEN 202	Digital Logic Design Sessional	1.50	3.00
5	CSE 205	CEN 203	Numerical Methods	3.00	3.00
6		EEE 201	Electronics Devices and Circuits	4.00	4.00
7		EEE202	Electronics Devices and Circuits Sessional	1.50	3.00
8		MAP 201	Mathematics III	3.00	3.00
			Total	19.75	23.50

Level 2 Semester II

Sl. No.	New Course Code	Old Course Code	Course Title	Credit	Hour(s) per Week
1	CSE 251	CIT 203	Theory of computation	2.00	2.00
2	CSE 253	CIT 205	Algorithms Analysis and Design	3.00	3.00
3	CSE 254	CIT 206	Algorithms Analysis and Design Sessional	0.75	1.50
4	CSE 255	CEN 205	Digital Electronics and Pulse Techniques	3.00	3.00
5	CSE 256	CEN 206	Digital Electronics and Pulse Techniques Sessional	1.50	3.00
6		EEE 203	Electrical Machines and Measurements	3.00	3.00
7		EEE204	Electrical Machines and Measurements Sessional	1.50	3.00
8		MAP 203	Mathematics IV	3.00	3.00
9		ACT 205	Financial and Managerial Accounting	2.00	2.00
			Total	19.75	23.50

Level 3 Semester I

Sl. No.	New Course Code	Old Course Code	Course Title	Credit	Hour(s) per Week
1	CSE 301	CIT 301	Software Engineering	3.00	3.00
2	CSE 303	CIT 303	Data Communication	3.00	3.00
3	CSE 305	CIT 305	Database	3.00	3.00
4	CSE 306	CIT 306	Database Sessional	1.50	3.00
5	CSE 307	CIT 307	Compiler	3.00	3.00
6	CSE 308	CIT 308	Compiler Sessional	0.75	1.50
7	CSE 309	CEN 301	Computer Architecture	3.00	3.00
8	CSE 312	CEN 302	Assembly Language Programming Sessional	1.50	3.00
9		ECN 303	Economics	2.00	2.00
			Total	20.75	24.50

Level 3 Semester II

Sl. No.	New Course Code	Old Course Code	Course Title	Credit	Hour(s) per Week
1	CSE 351	CIT 309	Operating System	3.00	3.00
2	CSE 352	CIT 310	Operating System Sessional	0.75	1.50
3	CSE 353	CIT 311`	Computer Networks	3.00	3.00
4	CSE 354	CIT 312	Computer Networks Sessional	0.75	1.50
5	CSE 355	CEN 303	Mathematical Analysis for Computer Science	3.00	3.00
6	CSE 357	CEN 305	Microprocessors	3.00	3.00
7	CSE 358	CEN 306	Microprocessors Sessional	1.50	3.00
8	CSE 359	CEN 307	Artificial Intelligence	3.00	3.00
9	CSE 360	CEN 308	Artificial Intelligence Sessional	0.75	1.50
			Total	18.75	22.50

Level 4 Semester I

Sl. No.	New Course Code	Old Course Code	Course Title	Credit	Hour(s) per Week
1	CSE 402	CIT 402	Project and Thesis Sessional	1.50	3.00
2	CSE 403	CIT 403	Machine Learning	3.00	3.00
3	CSE 405	CEN 401	Computer Interfacing	2.00	2.00
4	CSE 406	CEN 402	Computer Interfacing Sessional	0.75	1.50
5	CSE 407	CEN 403	Digital System Design	3.00	3.00
6	CSE 408	CEN 404	Digital System Design Sessional	1.50	3.00
7		MGT 405	Industrial Management	3.00	3.00
8		CIT/CEN	Option II (Theory + Sessional)	3.00+0.75	3.00+1.50
			Total	18.50	23.00

Option II

Sl. No.	New Course Code	Old Course Code	Course Title	Credit	Hour(s) per Week
1	CSE 409	CIT 405	System Analysis and Design	3.00	3.00
2	CSE 410	CIT 406	System Analysis and Design Sessional	0.75	1.50
3	CSE 411	CEN 407	Simulation and Modeling	3.00	3.00
4	CSE 412	CIT 408	Simulation and Modeling Sessional	0.75	1.50

Level 4 Semester II

Sl. No.	New Course Code	Old Course Code	Course Title	Credit	Hour(s) per Week
1	CSE 402	CIT 402	Project and Thesis Sessional	3.00	3.00
2	CSE 451	CIT 407	Basic Multimedia System	3.00	3.00
3	CSE 453	CIT 409	Computer Graphics	3.00	3.00
4	CSE 454	CIT 410	Computer Graphics Sessional	0.75	1.50
5	CSE 455	CEN 407	Pattern Recognition	3.00	3.00
6	CSE 457	CEN 409	VLSI Design	3.00	3.00
7	CSE 458	CEN 410	VLSI Design Sessional	0.75	1.50
8			Option III	3.00	3.00
			Total	19.50	21.00

Option III

Sl. No.	New Course Code	Old Course Code	Course Title	Credit	Hour(s) per Week
1	CSE 459	CIT 413	Graph Theory	3.00	3.00
2	CSE 461	CIT 411	Communication Engineering	3.00	3.00
3	CSE 463	CEN 413	Robotics	3.00	3.00

Summary

Level	Semester	Theory hours	Sessional hours	Credits
Level 1	Semester I	15.00	4.50	17.25
Level 1	Semester II	16.00	10.50	21.25
Level 2	Semester I	16.00	7.50	19.75
Level 2	Semester II	16.00	7.50	19.75
Level 3	Semester I	17.00	7.50	20.75
Level 3	Semester II	15.00	7.50	18.75
Level 4	Semester I	14.00	9.00	18.50
Level 4	Semester II	15.00	6.00	19.50
Total		124.00	60.00	155.50

Total Credits Required for the Degree of B.Sc. (Engineering) in CSE is 155.50

Detail of the Courses
Level 1 Semester I

CIT 101: Structured Programming Language Credit: 3

Number systems, Introduction to programming, Structural programming language, Data types, Operators, Expressions, Control structures, Scope rules and storage classes, Header files; Preprocessor; Array, Pointers, Structure and Union, User defined Function, Recursion, Enumerations, Standard and formatted input/output, File access, Error Handing, Graphics.

CIT 102: Structured Programming Language Sessional Credit: 1.5

Laboratory works based on CIT 101

MAP 101: Mathematics -1 (Differential Calculus and Co-ordinate Geometry) Credit: 3

Different Calculus: Functions and Expansion, Limits, Continuity, Derivatives and Application of Differentiation, Theorems: Leibniz's, Rolle's, Mean value and Euler's, Lagrange's and Cauchy's form of remainders, L'Hospital rule; Tangent and normal, Sub tangent and subnormal in Cartesian and polar co-ordinates, Maximum and minimum values of functions, Points of inflexion, Curvature, Asymptotes, Curve tracing.

Co-ordinate Geometry : Basic concepts of Point, Line, Plane, Slope, Segment, Ray, Distance, etc., Transformation of co-ordinate axes, Equation of conics, Parallel, Perpendicular and Graphing Lines: Homogeneous equation of second degree, Angle between the pair of straight lines, Pair of lines joining the origin to the point of intersection of two given curves, Circles: Circumference and arcs, perpendicular radii and tangents, Perpendicular radii and chords, Theorems about lengths of chords, Tangents and Secants, Orthogonal, Coaxial and Director Circles, Equations of Parabola; Ellipse and Hyperbola, Polar Parametric co-ordinates, Diameters.

MAP 103: Physics-1 (Mechanics, Waves and Optics) Credit: 3

Mechanics: Motion, Vectors, Projectile Fluid circular motion, Momentum, Center of gravity, Rotational mechanics, Structure of matter, Mechanical properties of matter, Bernoulli's theorem, Viscosity, Surface energy and tension, Determination of surface tension by different methods.

Waves: Introduction to Waves, Electromagnetic Wave, Standing Wave, Elastic Wave, Sound Wave, Wave Motion and Propagation, Huygens Principle.

Optics: Theories of Light; Reflection and Refraction; Diffraction and Interference, Lenses, Geometrical and Fourier optics.

MAP 104: Physics-1 (Mechanics, Waves and Optics) Sessional Credit: 0.75

Laboratory works based on MAP 103.

AIE 105: Basic Mechanical Engineering Credit: 3

Thermodynamics Zeroth, First and Second Laws of Thermodynamics, Thermodynamics System and Processes, Irreversibility and Availability, Entropy; Sources of Energy; Conventional and Renewable, IC Engines, Refrigeration and Air Conditioning Systems, Kinematics and Dynamics of Particles and Rigid Bodies, Forces in Trusses and Frames, Heat-Transfer: Modes of heat transfer, One dimensional heat conduction, Resistance Concept and Electrical Analogy.

SSL 101: English Credit: 3

Types of Sentences and their Constructions, Grammatical Problems and Common Errors, Vocabulary, English Phonetics, Spoken English, Developing Fluency, Reading Comprehension, Reading Strategies for Different Purposes, Paragraph Writing, Paragraph Development Techniques: Choice of Words, Mechanics of paragraph writing, Précis Writing, Amplification, Report Writing, Formal, Mechanics of Language, Business Correspondence and Tenders, Short stories.

Level 1 Semester II

CIT 103: Object Oriented Programming Credit: 2

Introduction to Object Oriented Programming (OOP), Abstraction, Object and its Reference, Classes, Methods, Parameter Passing, Encapsulation, Inheritance, Polymorphism, Constructors and Destructors, Exceptions, Object oriented I/O, Template functions and classes.

Reference Language: C++ and Java.

CIT 104: Object Oriented Programming Sessional Credit: 1.5

Laboratory works based on CIT 103.

CEN 101: Discrete Mathematics Credit: 3

Ser theory, Relations, Functions, Logics, Propositional and Predicate Calculus, Proof techniques, Structure of Formal Proofs, Direct Proofs, Proof by Counterexample, Contraposition, Contradiction and Mathematical Induction, Counting Arguments, Sum and Product Rule, Inclusion-exclusion Principle, Fibonacci Numbers, The pigeonhole Principle, Permutations and Combinations, Recurrence Relations, Graphs and Trees.

EEE 101: Introduction to Electrical Engineering Credit: 3

Charge, current and potential difference. Resistor, capacitor and inductor. Current-voltage relation for resistance, inductance and capacitor. Kirchoff's current Law (node equations) and Kirchoff's voltage Law (loop equations). Solution of node and loop equations. Duality and its uses. Magnetically coupled circuits and dot notation. First order differential equations. Forced and natural response. Analysis of R-C and R-L circuits. Effect of initial conditions. Second order differential equations and its standard form. Sinusoidal signals. Average and RMS values of

waveforms. Complex number notations. Phasors. Concept of lead and lag. Complex power and power factor.

EEE 102: Introduction to Electrical Engineering Sessional Credit: 1.50

Laboratory works based on EEE 101.

MAP 105: Mathematics- II (Integral Calculus and Ordinary and Partial Differential Equations) Credit: 3

Integral Calculus: Introduction to integration, integration by different methods, application of integration for finding area under a curve, are length, surface area and cancroids, improper and definite integrals, polar coordinates and area.

Ordinary Differential Equations: Introduction to ODE, solution of first order differential equations by various methods, properties of linear system and the linearity principle, solution of linear equations.

Partial Differential Equations: Introduction to PDE, different methods for solving PDE of order one, second order PDE: its nomenclature and classification to canonical-parabolic, elliptic, hyperbolic, solution by separation of variables; linear PDE with constant coefficients.

Series Solution: Solution of differential equations in series, Bessel's function, Legenders polynomial.

MAP 107: Physics-II (Electricity, Magnetism and Modern Physics) Credit: 3

Electricity: Electric filed and potential, divergence and curl of electrostatic fields, work and energy, polarization, field of a polarized object, electric displacement, conductors and semiconductors.

Magnetism: Lorentz force, Biot-Savart, Ampere's, Faradays and Lenzs laws, divergence and curl of magnetic field, magnetization and the field of a magnetized object, electromagnetic force, electromagnetic induction, maxwell's equations of electromagnetic waves, self inductance and mutual inductance, magnetic properties of matter.

Modern Physics: Theory of relativity, collision, interaction of photons with matter, space and time problems, Lorentz; elementary particles and forces, symmetry, conservation laws, Noether's theorem and group theory, nuclear dimensions, electron orbits, atomic spectra, Bohr atom model, radio active decay, nuclear binding energy; half life.

MAP 108: Physics-II Sessional Credit: 0.75

Laboratory works based on MAP 107

AIE 106: Engineering Drawing and AutoCAD Sessional Credit: 1.50

Technical lettering: One point; projection of points and straight lines, projection of simple solids, cylinders, cones, parallelepiped and pyramids in orthographic and isometric projections,

perspective projection: principles of perspective projection by orthographic method and vanishing point.

SSL 103: Sociology Credit: 2

Introduction: Definition, natures, scope, primary concept and importance of sociology, modernity of social theory, social and intellectual forces, idealism vs. empiricisms, intellectual background in French, German and Bangladesh, approaches to the study of Bangladeshi society, debates around social institutions and groups, family and kinship, household, village as a form of social organization, social stratification, tribes in Bangladesh, social evolution, industrial revolution, some current social problems in Bangladesh and their probable solutions.

SSL 105: Government Credit: 2

Basic concepts of government; good governance, politics, thinking politically in a culture of individuals, dynamic of liberty and government, functions, organs and forms of modern state and government, socialism, Fascism, Marxism, Constitution and structure of Bangladesh government, political process in Bangladesh, Administrative systems of developed countries, international politics.

MGT 105: Business Law Credit: 2

Business environment in Bangladesh, overview of logical system in Bangladesh, principals of law of contracts, company, corporate, intellectual property and laws in Bangladesh, Factory act(1965), Law of compensation (1965), rules and regulation for foreign investment in Bangladesh.

Level 2 Semester I

CIT 201: Data Structures Credit: 3

Basic concepts of data and its representation, arrays, linked lists, stacks, queues, trees, graphs, sorting, searching, hashing, heaps, fibonacci heaps, b-trees, recursion, storage management.

CIT 202: Data Structures Sessional Credit: 0.75

Laboratory works based on CIT 201.

CEN 201: Digital Logic Design Credit: 3

Number systems: base conversion and codes, 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 de multiplexers, combinational circuit design, flip-flops, race around problems, counters: asynchronous counters, synchronous counters, PLA design, synchronous circuit analysis and design, state diagram, Mealy and Moore circuit, state minimization and assignments, incompletely specified circuit.

CEN 202: Digital Logic Design Sessional Credit: 1.50

Laboratory works based on CEN 201.

CEN 203: Numerical Methods Credit: 3

Introduction to Taylor series, solution of algebraic and transcendental equations, method of interaction, false position method, Newton-Rhapson method, solution of simultaneous linear equations, Gramer's rule, iteraction method, Gauss-Jordan elimination method, interpolation diagonal and horizontal difference, differences of a polynomial, Newton's formula for forward and backward interpolation, spline interpolation, numerical integration and differentiation, solution of ordinary differential equations, Euler's method, Taylors series method, Runge-Kutta method, least squares approximation of functions, linear and polynomial regression, fitting exponential and trigonometric functions.

EEE 201: Electronic Devices and Circuits Credit: 4

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 202: Electronic Devices and Circuits Sessional Credit: 1.50

Laboratory works based on EEE 201.

MAP 201: Mathematics –III (Matrices, Vectors and Fourier analysis) Credit: 3

Matrix: Basic concepts of matrix and matrix operation, determinants, adjoin and inverse of matrix, transformations of matrix, matrix polynomials, normal, canonical and quadratic forms, symmetric matrices, coyly Hamilton theorem, eigen values and eigenvectors, application of matrix for solving linear equations.

Vector: Introduction, addition, subtraction and multiplication of vectors, linear dependence and independence of vectors, vector space and subspace, null, row and column spaces, dimension and basis of a vector space, linear transformation, differentiation and integration of vectors, gradients and directional derivatives, divergence, curl, gauss, green and stokes theorems.

Level 2 Semester II

CIT 203: Theory of Computation Credit: 2

Language theory; Regular sets: Finite automata, regular expressions, equivalence among notations, methods of proving a language not to be regular, Context free languages: Grammar, push-down automata, normal forms fore grammar proving languages non-context free; Turing machines.

CIT 205: Algorithms Analysis and Design Credit:3

Review of proof techniques, Basic algorithmic analysis: Asymptotic analysis of upper, average and lower complexity bounds best, average and worst case behaviors, Big-O, little-o, omega and theta notations, Standard complexity classes, Empirical measurement of performance, Time and space tradeoffs in algorithms, Analysis of recursive algorithms, Lower bound theory; NP-completeness, NP-hard and NP-complete problems. Algorithmic strategies: Brute-force, greedy, divide and conquer, dynamic programming, backtracking, branch and bound, heuristics, pattern matching and string/text algorithms, Approximation and parallel algorithms, Graph and tree algorithms: Depth-first and breadth–first traversals, shortest-path, transitive closure and minimum spanning tree algorithms.

CIT 206: Algorithms Analysis and Design Sessional Credit: 0.75

Laboratory works based on CIT 205.

CEN 205: Digital Electronics and Pulse Techniques Credit: 3

Introduction to IC fabrication processes, Transistor gates, MOS and CMOS gates, Digital integrated Logic Families: TTL, ECL, IIL and CMOS logic and their power, propagation delay and noise immunity, Electronic circuits for flip-flops, Counters and register, Memory systems, PLA's A/D and D/A converts 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, switching circuits, pulse generation, Multi vibrators, Schmitt trigger, blocking oscillators and time-base circuit, Timing circuits, Simple voltage sweeps.

CEN 206: Digital Electronics and Pulse Techniques Sessional Credit: 1.50

Laboratory works based on CEN 206.

EEE 203: Electrical Machines & Measurements Credit: 3

Introduction to poly phase circuits, Transformers: Construction and operating principle, open circuit and short circuit test, efficiency, equivalent circuit, power and current transformer, Construction and modeling of electric machines, Synchronous, induction, universal, permanent magnet DC and stepper motors.

Measurement: Basic Measurement of electrical quantities: Bridge, ammeter, voltmeter and wattmeter methods, Frequency and voltage Measurement using digital techniques, Transducers: Terminology, types, principles and application of photovoltaic, piezoelectric.

EEE 204 Electrical Machines & Measurements Sessional Credit: 1.5

Laboratory works based on EEE 203.

MAP 203: Mathematics-IV (Complex and Variable, Laplace Transforms and Statistics) **Credit: 3**

Complex Variable: Complex numbers and variables, Regions in the complex plane, Holomorphic functions and use of the Cauchy Riemann equations, Analytic functions: Taylors Series and Laurent Series, Classification of singularities of Complex functions and calculation of their residues, Paths in the complex plane, Contours and contour integration, Estimates and bound s of contour integrals, including ML Estimates, Cauchy Theorem and Cauchy Residue Theorem.

Laplace Transform: Laplace transforms and their properties, Inverse Laplace transform and the inverse transform theory, Application of Laplace transforms to partial differential equations. Statistics: Basic concepts of statistics, Univariate Analysis: Tests of means, skewness, kurtosis and normality, the paired t-test, Mann-Whitney rank test, elementary probability and sampling theory.

ACT 205: Financial and Management Accounting **Credit: 2**

Accounting concepts and conventions, Double entry book-keeping, Journal, Ledgers; Manufacturing Account, Profit and loss account; Balance sheet; Accounting as an information system, Recording of transaction, Preparation of trial balance, Preparation of financial statements, Analysis and interpretation of financial statement.

Concepts of cost; Elements of cost and cost centers, Methods of costing and break-even analysis, Overhead recovery method/rate, Costing system, Job costing, Unit costing; Process costing, Operation costing: Quotation price, Inventory valuation, Absorption costing and marginal/variable costing techniques, Budget and budgetary control.

Level 3 Semester I

CIT 301: Software Engineering **Credit: 3**

Generic view of software engineering, Software processes and modeling of software processes, Software design; Synthesis vs. iterative, top-down vs. bottom-up, data directed, modular automatic, redundant and defensive designs, Influences of languages in design process, Concepts of complexity measures, Models: COCOMO, tree, and statistical, Modeling languages: Z B and UML, Analysis: Complexity measures, memory requirements, and processing time, Testing methods, Debugging; Verification, validation and certification; Arthur Laemmel's scheme, object oriented analysis, design and testing; Concepts of software reliability and availability; Software fault detection and correction, Estimating number of bugs in a computer program, Quality assurance, Different cost estimation models and their comparisons; Software maintenance, Software project organization, management and documentation.

CIT 303: Data Communication **Credit: 3**

Review of Fourier transforms, Channel coding and capacity; Synchronous and asynchronous communications, Hardware interfaces, Multiplexers and concentrators and buffers, Analog and digital modulation techniques: AM, AM, PM, OOK, FSK, PSK, QPSK, QAM; pulse modulation- PCM, PPM, PAM, Delta modulation; Companding, Communication mediums and

their characteristics; Voice coding techniques, Speech redundancies, TDM, FDM; Layered concept of computer network architecture, ATM networks and switches.

CIT 305: Database Credit: 3

Database systems: History, motivation, and components of database systems, and data base management system functions, database architecture and data independence; Models: Entity-relationship, conceptual, relational, and object-oriented; Relational databases: Mapping conceptual schema to a relational schema, entity and referential integrity, relational algebra and relational calculus; Database query languages: Overview of database languages, SQL, Query optimization, Introduction to Object Query Language, Relational database design; File organization and access, Buffer, storage and transaction management; Recovery, Concurrency control; Reliability, protection and integrity, Performance analysis.

CIT 306: Database Sessional Credit: 1.5

Laboratory works based on CIT 305

CIT 307: Compiler Credit: 3

Introduction to compiling Lexical analysis, Parsing theory; Symbol tables, Type systems, Syntax and semantic analysis, Syntax-directed translation, Static checking, Intermediate representation, Attribute grammars, Run-time analysis, Code generation and optimization.

CIT 308: Compiler Sessional Credit: 0.75

Laboratory works based on CIT 307 and project works.

CEN 301: Computer Architecture Credit: 3

Computer hardware: Operation and operands, representing instructions, addressing modes and machine program sequencing; Assembly language programming; Arithmetic and logical operations, floating point operations-IEEE standard; processor design: Memory organization: cache, virtual; I/O system, Control Unit design – hardwired single cycle and multi-cycle and micro programmed; Hazards; Exceptions; Pipeline: pipelined data path and control, superscalar and dynamic pipelining; I/O devices, channels; Interrupt control; Direct Memory Access (DMA); Buses: Interfacing I/O devices; Designing I/O systems; CISC, RISE and Stack processors; Multiprocessors.

CEN 302: Assembly Language Programming Sessional Credit: 1.5

Assemblers and Interpreters, Intel 8086 assembly language programming, Instruction types and their formats, Assembly program format, Addressing techniques, Interrupts and system services, High level control structure formation, subroutines and macros, String processing, Concurrent processes and high level linking, file system and file 1/0 handling, Assembly language for MIPS processors.

ECN 303: Economics Credit: 2

Scope and subject matters of economics, Various economic system, Fundamental economic problems and their solutions, Economic growth and development, Markets and government in a modern economy, Demand and supply, Elastic ties, Market structure, Monopoly, perfect

competition, oligopoly, Micro economy and macro economy, Free market economy and its impact on Bangladesh.

Level 3 Semester II

CIT 309: Operating System Credit: 3

Operating system concepts, Operating system structure, Processes and threads: process model and implementation, inter-process communication (IPC), process scheduling, Process Synchronization, Deadlock detection, prevention and recovery; Memory management, swapping, paging, segmentation , virtual memory system; input/output: hardware, software, disk, terminals, clocks, File systems and directories, Security and protection; multiprocessing and time-sharing; Study of Linux as an example of OS.

CIT 310: Operating System Sessional Credit: 0.75

Laboratory works based on CIT 309

CIT 311: Computer Networks Credit: 3

Protocol layers and hierarchies: Data link control: HLDC, DLL in Internet, LAN Protocols: Standards IEEE 802, Switches and Hubs, Bridges, FDDI, Fast Ethernet, Routing algorithm, Congestion control, Internetworking, WAN, Fragmentation, IPV4, IPV6, ARP, RARP, Mobile IP, Transport protocols, Transmission control protocol, Connection management, Transmission policy, congestion control, timer management; UDP, Network security, Basic cryptography and their standards, Public key algorithm, Authentication protocols, Digital signatures, Gigabit Ethernet, Abstract syntax notations, Domain Name System: Name servers, Email and its privacy, SNMP, HTTP, World Wide Web.

CIT 312: Computer Networks Sessional Credit: 0.75

Laboratory works based on CIT 311

CEN 303: Mathematical Analysis for Computer Science Credit: 3

Review of O, Omega and theta-notations and summation of series, Basic number theory; Special numbers, Generating functions, Optimizations techniques, Linear programming, Random variables, Stochastic process, Markov chains, Queuing model, Open and closed queuing network, Application of queuing models in Computer Science.

CEN 305: Microprocessors Credit: 3

Introduction to 8 bit microprocessor, 16 and 32 bit microprocessors, architecture, addressing modes, instruction set, interrupts, multi-tasking and virtual memory; Memory interface; Programmable peripheral interface, Keyboard / display interface; Arithmetic co-processor, Programmable interval timer; Programmable interrupt controller; DMA controller; Floppy and hard-disk controller, Bus interface.

CEN 306: Microprocessors Sessional Credit: 1.5

Laboratory works based on CEN 305

CEN 307: Artificial Intelligence Credit: 3

Fundamental issues in intelligent systems, History of artificial intelligence, Philosophical questions, fundamental definitions, modeling the world, the role of heuristics, Agents: Definition of agents, successful applications and state-of-the-art agent based systems, software agents, multi agent systems, Knowledge representation and reasoning, Search and constraint satisfaction, Heuristic search, brute-force search, greedy search, best-first search, constraint satisfaction, simulated annealing, local search, Game playing, Expert systems.

CEN 308: Artificial Intelligence Sessional Credit: 0.75

Laboratory works based on CEN 307

Level 4 Semester I

CIT 402: Project and Thesis Sessional Credit: 1.5

Study problems in the field of Computer Science and Engineering.

CIT: 403 Machine Learning Credit: 3

Introduction to machine learning, Supervised, unsupervised and reinforcement learning and algorithms, Decision tree learning, Learning classification and association rules, Bayesian learning, Instance-based learning and clustering, Introduction to genetic algorithms, Computational learning theory.

CEN 401: Computer Interfacing Credit: 2

Data acquisition and introduction to microprocessor based systems, Designing I/O systems, Programmable peripheral, Serial communication interface, Barcode reader, Sound card, MIDI interface, Printer interface, microprocessor interfacing with Standard bus, interfacing with power circuits, stepper motors, opto-isolation, Controlling semiconductor power switches- MOSFET, BJT, SCR, Triac and Solenoids.

CEN 402: Computer Interfacing Sessional Credit: 0.75

Laboratory works based on CEN 401

CEN 403: Digital System Design Credit: 3

Design using TTL, ECL and CMOS 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, Microprocessor based design, Design using special purpose controllers, Design of real-time systems, Use of VHDL in design.

CEN 404: Digital System Design Sessional Credit: 1.5

Laboratory works based on CEN 403

MGT 405: Industrial Management Credit: 3

Management and Organization: Principal of management, elements of management, organization structure charts, line and committee organization; Personnel management; Functions, Job evaluation, merit rating, wages and incentives, Systems management; Project management, re-

design, risk management, recycling and manufacturing systems; thinking and supply change management; Industrial management, Strategic Planning, running an engineering company and project management, Technology management, Management of innovation and changes, technology life cycle, Case studies; Production materials management: production types, inspection and quality control; Marketing management, Market research and sales forecasting, sales management, advertisement and sales promotion.

CIT 405: System Analysis and Design Credit: 3

System structure, People, Processes and data; databases, personal system, centralized system and distributed system, Types and qualities of information, Analysis: Information requirements, steps of systems, feasibility and technical facilities, Systems development approaches, development Process, processing types and systems, management process, System development life cycle: linear or Waterfall Cycle, iterative Cycles, System design and modeling: logical and physical design, user interface design, interface design tools, user interface evaluation, introduction to process modeling, introduction to data modeling, System design-techniques: Document flow diagrams, data flow diagrams and structure charts, Object modeling: Modeling behavior, Design of real-time system, Project management and documentation; Analysis of system maintenance and upgrading; Software reuse, Productivity tools, Ethics and privacy.

CIT 406: System Analysis and Design Sessional Credit: 0.75

Laboratory works based on CIT 405 and CIT 301

CEN 407: Simulation and Modeling Credit: 3

Systems, models and simulation, Classification of simulation, Steps in a simulation study, Concepts in discreet-event simulation: event-scheduling vs. process-interaction approaches, Time –advance mechanism, organization of a discreet-event simulation model, Continuous discreet-event simulation models, Combined discreet- continuous models, Monte Carlo simulation, Simulation of queuing systems, Generating random numbers and random variants, Output analysis, simulation model validation principles and techniques, simulation outputs, input modeling, simulation languages, Analysis and modeling of some practical problems of computer science and engineering.

CEN 408: Simulation and Modeling Sessional Credit: 0.75

Laboratory works based on CEN 407

Level 4 Semester II

CIT 402: Project and Thesis Sessional Credit: 3

Continuation of Project/ Thesis of Level IV, Semester I

CIT 407: Basic Multimedia System Credit: 3

Media and data streams, Coding and compression standards- JPEC, H_26_1, MPEG, DVI; Audio, Images, Graphics, Video and animation, Architectural and Opening systems issues in multimedia- real-time OS issues, synchronization, interrupt handling, Multimedia Databases,

Multimedia communication- Quality-of-service guarantees, Session directories, Protocols for controlling session, Security issues in multimedia, User interfaces, multimedia applications- media preparation, integration, communications, consumption etc.

CIT 409: Computer Graphics Credit: 3

Credit: 3

Graphic systems: Raster and vector graphic systems, video display devices, physical and logical input devices, Fundamental techniques in graphics: Hierarchy of graphics software, using a graphics API, simple color models, homogeneous coordinates, transformations and clipping, Graphical algorithms, Line generation algorithms, structure and use of fonts, parametric polynomial curves and surfaces, polygonal representation of 3D objects, parametric polynomial curves and surfaces, Introduction to ray tracing, image synthesis, sampling techniques, anti-aliasing and image enhancement; Graphical user-interface design and programming, Computer animation; Key-frame animation, camera animation, scripting system, animation of articulated structures.

CIT 410: Computer Graphics Sessional Credit: 0.75

Credit: 0.75

Laboratory works based on CIT 409

CEN 407: Pattern Recognition Credit: 3

Credit: 3

Introduction to pattern recognition and its applications, Bayesian decision theory, Bayesian estimation: Gaussian distribution, ML estimation, EM algorithm, Dimensionality Reduction; Linear Discriminant Functions, Nonparametric pattern recognition, k-nearest classifiers, Template matching; optimal path searching techniques, dynamic programming methods, correlation methods, Context dependent classification, Observable and Hidden Markov models, Viterbi algorithm.

CEN 409: VLSI Design Credit: 3

Credit: 3

Introduction on VLSI circuits: NMOS, CMOS and BICMOS technology, processes and yield, first order and second order phenomenon in MOS, Stick diagram, Noise considerations, power dissipation, Design and operation of large fan out and fan in circuits, circuit optimization techniques, clocking methodologies, data path and control design, VLSI layouts partitioning,

placement routing and wiring in VLSI, Simulation techniques, Parallel processing, Special purpose architectures in VLSI.

CEN 410: VLSI Design Sessional Credit: 0.75

Credit: 0.75

Laboratory works based on CEN 409

CIT 413: Graph Theory Credit: 3

Graphs and basic properties: Graphs and examples, bipartite, degree, connected, components, adjacency and incidence matrices, isomorphism, automorphism, walks, trails, paths, cycles, distance, distance, diameter, girth; Special and algorithms: Eulerian graphs, Hamiltonian's coding algorithm; planar graphs and coloring: Basic concepts, DMP planarity algorithm, Euler's formula, Dual graphs, Chromatic number, Four color theorem, chromatic polynomials, Brelaz's coloring algorithm.

CIT 411: Communication Engineering Credit: 3

Fiber Optic Communication: Introduction, Principle of light transmission in a fiber, propagation of light in an optical fibre: ray model and wave model. Losses in fibers, Dispersion, Light sources for fibers, Photo detector connector and splices. Fiber optic link design, Power and rise time budget, Optical amplifiers, Introduction to high speed long distance fiber optic links.

Satellite Communication: Introduction, Satellite construction, Orbits, Station keeping, Satellite altitude, Transmission path, Path loss, Noise considerations, Satellite system, Saturation flux density, Effective isotropic radiated power, Multiple access methods, Modulation schemes used in the satellite links, FDMA, TDMA, CDMA and packet switched system, Satellite classes, Low orbit satellites for mobile communication, Earth station, Satellite link analysis.

Radar: Basic principle, Radar equation and range, Factors influencing maximum range, Effect of noise, Power, Frequencies used in Radar, Types of Radar, CW & FM radar; Doppler effect; MTI & Pulse radar; Duplexer radar receiver; Indicator and timers; Altimeter and IFF equipment; Tracking radar systems and search systems, Radar beacon.

Cellular Mobile Telephone: Mobile telephone systems, Trunking efficiency, Basic cellular system, Performance criteria, Mobile radio environment, Operation of cellular systems, Planning a cellular systems, Analog and digital cellular systems.

GSM standards and Spread Spectrum Systems: GSM architecture, elements, and standard interfaces; FDMA/TDMA structure; Speech and channel coding in GSM; Time slots and bursts; Signaling; Hand-offs; DCS 1800; GPRS; EDGE; WiMax; data services over GSM. Spread Spectrum Communications: Pseudonoise sequences, direct sequence spread spectrum, frequency hopping spread spectrum, CDMA, application examples.

CEN 413: Robotics Credit: 3

Introduction: Historical development of robots, basic terminology and structure, robots in automated manufacturing; Rigid motions and homogeneous transformations: rotations and their composition, Euler angles, roll- pitch- yaw, angular velocity and acceleration, homogeneous transformations; Forwarded kinematics: Common robot configurations, Denavit-Hartenberg convention, A-matrices, T-matrices, Inverse kinematics: Planar mechanisms, geometric

approaches, spherical wrist; Velocity kinematics: Jacobian; singular configurations,
manipulability, singular values, pseudoinverse, Dynamics: Generalized coordinates/virtual work, Euler- Lagrange equations, manipulator kinetic and potential energies, Robot programming.