
# Course Summary
# And
# Detailed Syllabus for B.Sc (Engg.) in CSE

**Registration Session: 2014-15**

**Department of Computer Science and Engineering (CSE)**
**Faculty of Engineering and Technology**

**Jessore University of Science & Technology (JUST)**
**Jessore, Bangladesh**

## COURSE SUMMERY IN FIRST YEAR

| 1st YEAR 1st SEMESTER | | | | |
|---|---|---|---|---|
| **Course Code** | **Course Title** | **Theory Hrs/Week** | **Laboratory Hrs/Week** | **Credit** |
| CSE 1101 | Computer Fundamentals | 3 | 0 | 3.0 |
| CSE 1102 | Computer Fundamentals Laboratory | 0 | 3 | 1.5 |
| CSE 1103 | Discrete Mathematics | 3 | 0 | 3.0 |
| EEE 1101 | Basic Electrical Technology | 3 | 0 | 3.0 |
| EEE 1102 | Basic Electrical Technology Laboratory | 0 | 3 | 1.5 |
| MATH 1101 | Integral and Differential Calculus | 3 | 0 | 3.0 |
| PHY 1101 | Physics | 2 | 0 | 2.0 |
| ENG 1101 | Communicative English | 2 | 0 | 2.0 |
| IPE 1102 | Drawing and CAD Project Laboratory | 0 | 3 | 1.5 |
| | | | **Total Credits:** | **20.5** |

| 1st YEAR 2nd SEMESTER | | | | |
|---|---|---|---|---|
| **Course Code** | **Course Title** | **Theory Hrs/Week** | **Laboratory Hrs/Week** | **Credit** |
| CSE 1201 | Structured Programming Language | 3 | 0 | 3.0 |
| CSE 1202 | Structured Programming Language Laboratory | 0 | 3 | 1.5 |
| CSE 1203 | Digital Logic Design | 3 | 0 | 3.0 |
| CSE 1204 | Digital Logic Design Laboratory | 0 | 3 | 1.5 |
| HUM 1201 | Economics, Government and Sociology | 2 | 0 | 2.0 |
| EEE 1201 | Electronic Circuit, Devices and Instrumentation. | 3 | 0 | 3.0 |
| EEE 1202 | Electronic Circuit, Devices and Instrumentation Laboratory | 0 | 3 | 1.5 |
| MATH 1201 | Matrix and Differential Equations | 3 | 0 | 3.0 |
| CHEM 1201 | Chemistry | 2 | 0 | 2.0 |
| | | | **Total Credits:** | **20.5** |

## COURSE SUMMERY IN SECOND YEAR

| 2nd YEAR 1st SEMESTER | | | | |
|---|---|---|---|---|
| **Course Code** | **Course Title** | **Theory Hrs/Week** | **Laboratory Hrs/Week** | **Credit** |
| CSE 2101 | Object Oriented Programming Language | 3 | 0 | 3.0 |
| CSE 2102 | Object Oriented Programming Language Laboratory | 0 | 3 | 1.5 |
| CSE 2103 | Computer Architecture and Organization | 3 | 0 | 3.0 |
| CSE 2105 | Data Structures and Algorithms | 3 | 0 | 3.0 |
| CSE 2106 | Data Structures and Algorithms Laboratory | 0 | 3 | 1.5 |
| CSE 2108 | Lab (C++/Java/C#) | 0 | 2 | 1.0 |
| EEE 2101 | Digital Electronics and Pulse Technique | 3 | 0 | 3.0 |
| EEE 2102 | Digital Electronics and Pulse Technique Laboratory | 0 | 3 | 1.5 |
| MATH 2101 | Geometry and Vector Analysis | 3 | 0 | 3.0 |
| | | | **Total Credits:** | **20.5** |

| 2nd YEAR 2nd SEMESTER | | | | |
|---|---|---|---|---|
| **Course Code** | **Course Title** | **Theory Hrs/Week** | **Laboratory Hrs/Week** | **Credit** |
| CSE 2201 | Algorithm Analysis and Design | 3 | 0 | 3.0 |
| CSE 2202 | Algorithm Analysis and Design Language Laboratory | 0 | 3 | 1.5 |
| CSE 2203 | Operating System | 3 | 0 | 3.0 |
| CSE 2204 | Operating System Laboratory | 0 | 3 | 1.5 |
| CSE 2205 | Database Systems | 3 | 0 | 3.0 |
| CSE 2206 | Database Systems Laboratory | 0 | 3 | 1.5 |
| CSE 2207 | Probability and Statistics | 3 | 0 | 3.0 |
| CSE 2208 | Probability and StatisticsLaboratory | 0 | 3 | 1.5 |
| MATH 2201 | Linear Algebra, Fourier Transform and Complex Variables | 3 | 0 | 3.0 |
| CSE 2200 | Viva-Voce | 0 | 0 | 1.0 |
| | | | **Total Credits:** | **22.0** |

## COURSE SUMMERY IN THIRD YEAR

| 3rd YEAR 1st SEMESTER | | | | |
|---|---|---|---|---|
| **Course Code** | **Course Title** | **Theory Hrs/Week** | **Laboratory Hrs/Week** | **Credit** |
| CSE 3101 | Numerical Methods | 3 | 0 | 3.0 |
| CSE 3102 | Numerical Methods Laboratory | 0 | 3 | 1.5 |
| CSE 3103 | Microprocessor and Assembly Language | 3 | 0 | 3.0 |
| CSE 3104 | Microprocessor and Assembly Language Laboratory | 0 | 3 | 1.5 |
| CSE 3105 | Data Communication | 3 | 0 | 3.0 |
| CSE 3106 | Data CommunicationLaboratory | 0 | 3 | 1.5 |
| CSE 3107 | Software Engineering | 3 | 0 | 3.0 |
| CSE 3108 | Software Engineering Laboratory | 0 | 3 | 1.5 |
| CSE 3109 | Theory of Computation | 3 | 0 | 3.0 |
| CSE 3110 | Web Development Laboratory | 0 | 2 | 1.0 |
| CSE 3100 | Project (RDBMS) | 0 | 2 | 1.0 |
| | | | **Total Credits:** | **23.0** |

| 3rd YEAR 2nd SEMESTER | | | | |
|---|---|---|---|---|
| **Course Code** | **Course Title** | **Theory Hrs/Week** | **Laboratory Hrs/Week** | **Credit** |
| CSE 3201 | Computer Networks | 3 | 0 | 3.0 |
| CSE 3202 | Computer Networks Laboratory | 0 | 3 | 1.5 |
| CSE 3203 | Compiler Design | 3 | 0 | 3.0 |
| CSE 3204 | Compiler Design Laboratory | 0 | 3 | 1.5 |
| CSE 3205 | Peripherals and Interfacing | 3 | 0 | 3.0 |
| CSE 3206 | Peripherals and Interfacing Laboratory | 0 | 3 | 1.5 |
| CSE 3207 | Digital Signal Processing | 2 | 0 | 2.0 |
| CSE 3208 | Digital Signal Processing Laboratory | 0 | 2 | 1.0 |
| CSE 3209 | Accounting and Information System | 2 | 0 | 2.0 |
| CSE 3200 | Viva-Voce | 0 | 0 | 1.0 |
| | | | **Total Credits:** | **19.5** |

## COURSE SUMMERY IN FOURTH YEAR

| 4th YEAR 1st SEMESTER | | | | |
|---|---|---|---|---|
| **Course Code** | **Course Title** | **Theory Hrs/Week** | **Laboratory Hrs/Week** | **Credit** |
| CSE 4101 | Artificial Intelligence | 3 | 0 | 3.0 |
| CSE 4102 | Artificial Intelligence Laboratory | 0 | 3 | 1.5 |
| CSE 4103 | Simulation and Modeling | 3 | 0 | 3.0 |
| CSE 4104 | Simulation and ModelingLaboratory | 0 | 3 | 1.5 |
| CSE 4105 | Image Processing | 3 | 0 | 3.0 |
| CSE 4106 | Image ProcessingLaboratory | 0 | 3 | 1.5 |
| CSE 4107 | Parallel and Distributed Processing | 3 | 0 | 3.0 |
| CSE 4109 | Information Security and Control | 3 | 0 | 3.0 |
| CSE 4110 | Mobile Apps Development Laboratory | 0 | 2 | 1.0 |
| CSE 4000 | Thesis/Project | 0 | 0 | 3.0 |
| | | | **Total Credits:** | **23.5** |

| 4th YEAR 2nd SEMESTER | | | | |
|---|---|---|---|---|
| **Course Code** | **Course Title** | **Theory Hrs/Week** | **Laboratory Hrs/Week** | **Credit** |
| CSE 4201 | Computer Graphics and Multimedia | 3 | 0 | 3.0 |
| CSE 4202 | Computer Graphics and Multimedia Laboratory | 0 | 3 | 1.5 |
| CSE 4203 | Pattern Recognition and Neural Computing | 3 | 0 | 3.0 |
| CSE 4205 | IT Organization, Management and Professional Ethics | 3 | 0 | 3.0 |
| CSE XXXX | Optional course | 3 | 0 | 3.0 |
| CSE XXXX | Optional course | 3 | 0 | 3.0 |
| CSE 4210 | Industrial Tour | 0 | 0 | 1.0 |
| CSE 4000 | Thesis/Project | 0 | 0 | 3.0 |
| CSE 4200 | Viva-Voce | 0 | 0 | 1.0 |
| | | | **Total Credits:** | **21.5** |

| **Two optional courses from bellow** | | | | |
|---|---|---|---|---|
| CSE 4207 | VLSI Design | 3 | 0 | 3.0 |
| CSE 4209 | Basic Graph Theory | 3 | 0 | 3.0 |
| CSE 4211 | Introduction to Bio-Informatics | 3 | 0 | 3.0 |
| CSE 4213 | Data Mining and Warehousing | 3 | 0 | 3.0 |
| CSE 4215 | Cryptography | 3 | 0 | 3.0 |
| CSE 4217 | Management Information System | 3 | 0 | 3.0 |
| CSE 4219 | Pattern Recognition and Computer Vision | 3 | 0 | 3.0 |
| CSE 4221 | Network Security | 3 | 0 | 3.0 |
| CSE 4223 | Digital Forensic Science | 3 | 0 | 3.0 |
| CSE 4224 | Digital Forensic Science Laboratory | 0 | 3 | 1.5 |
| CSE 4225 | Nano Technology | 3 | 0 | 3.0 |

**NB: The Courses CSE 4000 of 1st semester and CSE 4000 2nd semester should be evaluated combined after completing CSE 4000 of 2nd semester**

## COURSE DETAILS IN FIRST YEAR 1st SEMESTER

**CSE 1101: Computer Fundamentals**
**Credits: 2.0 Pre-Requisites: Nil Contact Hours: 2 Hours/Week**

**Introduction of computer and its Organization:** Historical evolution of computers & classification, Computer generations, Basic organization and functional units of computer, impact of computer on society.

**Number Systems and Codes:** Non-positional/positional number system, different number systems & their conversion, Fractional numbers, Numeric/alphanumeric data, BCD/EBCDIC/ASCII code, Parity code.

**Binary arithmetic and logical operation:** Addition, subtraction, multiplication and division, AND, OR, NOT, XOR, NOR, NAND, complement, logic gates.

**I/O devices and Internal organization of computer:** Input/output/storage/arithmetic logic/control and central processing unit, internal structure of CPU, Keyboard, Mouse, Printers, Scanner, and other devices.

**Computer Memory:** Memory location and address, RAM, ROM, PROM, and EPROM, cache memory, Magnetic tape and disk, hard disk, CDROM, DVDROM, optical disk.

**Computer program, software and language:** Program planning, algorithms, flow charts, pseudo code, Software and firmware, types of computer software, types of computer language, translator, interpreter, compiler, virus, worms, Operating System.

**Data Communication and Computer Network:** Basic elements of a communication system, Types of communications among computers, Computer Networks, LAN, MAN, WAN, Wi-Fi, Wi-MAX, Optical Fiber, VoIP.

**Business data processing, Multimedia and Internet:** WWW, WAP, GPRS, GSM, EDGE, 3G, Internet, Internet services.

**E-Commerce:** E-governance, E-learning,E-shopping, Mobile Apps.

**Recommended Texts:**


1. Fundamentals of Computer, Author: P. K. Sinha
2. Fundamentals of Computers, Author:V. Rajaraman
3. Introduction to Computer Science Vol. I & II, Author:Jain, Satish
4. Elements of Computer Science Vol. I, Author:Balasubramanian
5. Fundamental of Computer, Author:Lutfur Rahman


**CSE 1102:Computer Fundamentals Laboratory**
**Credits: 1.5 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 1101.**

**CSE 1103: Discrete Mathematics**
**Credits: 3.0 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

**Mathematical Logic:** Statements and Notation, Connectives: Negation, Conjunction, Disjunction, Statement Formulas and Truth Tables; Conditional and Bi-conditional; Tautologies; Equivalence of Formulas; Duality Law; Tautological Implications; Functionally Complete Sets of Connectives; Normal Forms; Ordering and Uniqueness of Normal Forms; Rules of Inference; Methods of Proof.

**Set Theory:** The power set, Cartesian products,Using set notation with quantifiers, set operations, set identities generalized unions and intersections, computer representations of sets.

**Predicate Calculus:** Predicates; Statement Function; Variables; and Quantifiers; Predicate Formulas; Free and Bound Variables; the Universe of Discourse.

**Rules of Inference:** Universal Specification; Existential Specification; Existential Generalization; and Universal Generalization, Mathematical Induction.

**Elements of Number Theory:** Modular Arithmetic and the Euclidean Algorithm.

**Relations and Functions:** Properties of Binary Relations, Composition of Binary relations, Relation matrix and Graph of a Relation. Functions: Characteristic function, Floor function, Ceiling function and Hashing functions.

**Elements of Group Theory:** Algebraic Structure, Semi groups; Isomorphism and Homomorphism of Semi groups; Groups; Group Homomorphism.

**EEE 1101: Basic Electrical Technology**

**Credits: 3** **Pre-Requisites: Nil** **Contact Hours: 3 Hours/Week**

**Fundamental electrical concepts**: Different measuring units, DC voltage, current, resistance and power; Series, networks definitions, mesh and node circuit analysis, reduction of a complicated network, conversion between T and $\pi$ section.

**Networks transformations**: Equivalent circuit, Superposition theorem, the reciprocity theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem.

**A.C Circuits:** Instantaneous and r.m.s. values of current, voltage and average power, Use of complex quantities in AC circuits, resonant circuits, Q value and band width, frequency response.

**Introduction to magnetic Circuit:** Transformer working principle, construction, and maintenance, transformer's emf equations, transformer regulation and efficiency, different types of transformer.

**Capacitor and Capacitance:** Capacitance, Parallel plate capacitor, cylindrical capacitor, spherical capacitor, capacitors in series & parallel, energy stored in a capacitor, transformers.

**Transient:** Transients in RC, RL, RLC Circuits; Energy in magnetic field.

**Electric Filters**: Properties of symmetrical networks filter fundamentals, Characteristics impedance, different types of filters, propagation constant and frequency response. Active filters.

**Electromagnetic Field:** Maxwell's Equation, Electromagnetic wave equation and propagation, Pointing vector, Faraday's laws of electromagnetic induction, Lenz's Law, Motional e.m.f, Eddy current. Self and Mutual Inductance.

**EEE 1102:Basic Electrical Technology Laboratory**

**Credits: 1.5** **Pre-Requisites: Nil** **Contact Hours: 3 Hours/Week**

Laboratory works based on **EEE 1101**

**MATH 1101: Integral and Differential Calculus**

**Credits: 3.0** **Pre-Requisites: Nil** **Contact Hours: 3 Hours/Week**

**Differential Calculus:** Limit, Continuity and differentiability; Significance of derivatives; Successive differentiation of various types of functions; Leibniz's theorem; Rolle's theorem; Mean value theorem; Taylor's theorem in finite and infinite forms; Maclaurin's theorem in finite and infinite forms; Lagrange's form of remainders; Cauchy's form of remainder; Expansion of functions by differentiation and integration; Partial differentiation; Euler's theorem; Tangent, Normal, Sub tangent and subnormal in Cartesian and polar coordinates; Determination of maximum and minimum values of functions; Points of inflection with Applications; Evaluation of indeterminate forms by L'Hospitals rule; Curvature, radius of curvature, center of curvature and chord of curvature; Asymptotes; Curve tracing.

**Integral Calculus:**Definitions of integration; Integration by method of substitution; Integration by parts; Integration by the method of successive reduction; Definite integrals, its properties and use in summing series; Wallis's formulae; Improper Integrals; Beta function and Gamma function; Area under a plane curve in Cartesian and Polar co-ordinates; Area of the region enclosed by curve in Cartesian and Polar co-ordinates; Arc lengths of curves in Cartesian and Polar coordinates, parametric and pedal form; Intrinsic equation; Volume of hollow solids of revolution by shell method; Area of surface of revolution; Jacobian, multiple integrals and their applications.

**PHY 1101: Physics**

**Credits: 3** **Pre-Requisites: Nil** **Contact Hours: 3 Hours/Week**

**Properties of Matter:** Motion, Force, Work, Energy, Elasticity.

**Heat and Thermodynamics:** First Law of thermodynamics and its application, reversible and irreversible processes, Second Law of thermodynamics, Carnot cycle; Efficiency of heat engines, Carnot's Theorem, entropy and disorder, thermodynamic functions, Maxwell relations, Clausius-Clapeyron Equation, Third Law of thermodynamics.

**Physical Optics:** Theories of light; Interference of light, analytical; treatment of interference, theory of interference fringes, Young's double slit experiment; Diffraction of light**:** Fresnel and Fraunhoffer diffraction, diffraction by single slit, diffraction from a circular aperture; Polarization**:** production and analysis of polarized light, Brewster's law, Malus law, Polarization by double refraction, Nicol prism, optical activity, polarimeters, Polaroid.

**Waves and Oscillations:** Differential equation of a simple harmonic oscillator, total energy and average energy, combination of simple harmonic oscillations, microphones and loud speaker; carbon microphone, condenser microphone, moving coil electrodynamics microphones, loud speaker. Architectural acoustics; reverberation time, Sabine's formulae, theoretical treatment of reverberation time, live room, dead room.

**ENG 1101: Communicative English**

**Credits: 2** **Pre-Requisites: Nil** **Contact Hours: 2 Hours/Week**

Reading Comprehension, vocabulary building, précis/summarizing, development of writing skill, paragraph development, report writing, letter writing (formal/informal), basic grammar, news paper article writing

**IPE 1102: Drawing and CAD Project Laboratory**

**Credits: 1.5** **Pre-Requisites: Nil** **Contact Hours: 3 Hours/Week**

Introduction, Scale drawing, Isometric views, Orthographic view, Missing line, Sectional view, Auxiliary view, Project on Engineering Drawing and CAD using AutoCAD or contemporary packages instructed by the teachers.

## COURSE DETAILS IN FIRST YEAR 2nd SEMESTER

**CSE 1201: Structured Programming Language**
**Credits: 3 Pre-Requisites: CSE 1101 Contact Hours: 3 Hours/Week**

**Problem solving techniques:** Problem Analysis, Algorithm, Coding and Documentation.

**Programming in C:** An overview of C; variables, constants, operators and expressions; program control statements; functions, arrays, pointers, Structures, unions and user-defined types and enumeration; Storage Management and Dynamic Data Structures; Input, Output and disk files, File management; Pre-processors, Bit field operators.

**CSE 1202: Structured Programming Language Laboratory**
**Credits: 1.5 Pre-Requisites: CSE 1102 Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 1201**

**CSE 1203: Digital Logic Design**
**Credits: 3 Pre-Requisites: CSE 1101 Contact Hours: 3 Hours/Week**

**Introduction to Logic Gates:** Different types of logic gates and their truth table, Boolean Algebra, Combinational logic circuits, Minimization of logic functions: Karnaugh map, and Quine-McClusky methods.

**Digital Arithmetic Circuits:** Half adder; Full adder; Parallel adders; 2's complement system; Look ahead carry adder; The BCD adder.

**Combinational Logic Circuits:** Decoder, Encoder, 7-segment Decoder, Multiplexer and Demultiplexers, ROM design, PLA design.
**Sequential Logic circuits:** Flip-flop, Latches, types of flip-flops, FF timing considerations, Master-slave flip-flops, FF applications, flip flop excitation tables, state diagram, state table, state reduction and assignment, design of sequential circuits.

**Counters and Registers:** Asynchronous and Synchronous counter, registers, n-mod counters, propagation delay, Parallel up, down and up/down counters, Johnson counters, presettable counters, cascading counters, Shift-register counters.

**CSE 1204: Digital Logic Design Laboratory**
**Credits: 1.5 Pre-Requisites: CSE 1102 Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 1203**

**HUM 1201: Economics, Governments and Sociology**

**Credits: 2** **Pre-Requisites: Nil** **Contact Hours: 2 Hours/Week**

**Economics:** Nature of the economics theory. Some basic concepts - supply, demand and their elasticities. The relationship among average, margin and total and their derivation. Equilibrium - stable, straight and dynamic equilibrium. Consumer's equilibrium-indifference curve, producer's equilibrium-isoquant. Production-factors of production, production possibility curve-equilibrium of a firm, fixed cost and variable cost, the short run and the long run. The cost curves and supply curves, law of returns, internal and external economics and diseconomies. Economics of development and planning, basic concept-saving, investment, GNP, NNP. Fiscal policy, monetary policy and trade policy, some planning tools-capital output ratio, input analysis.

**Sociology:** Scope, Social evolution and techniques of production, Culture and civilization, Social structure of Bangladesh. Population and world resources. Oriental and Occidental societies, Industrial revolution. Family - Urbanization and industrialization, Urban Ecology, Co-operative and socialist movements, Rural sociology.

**EEE 1201: Electronic Circuits, Devices and Instrumentation**
**Credits: 3** **Pre-Requisites: EEE 1101** **Contact Hours: 3 Hours/Week**

**Theory of semiconductors**: Electronic structure of the elements, crystalline and amorphous solids, different types of crystal, band theory of solids, structure of silicon and germanium

**Intrinsic and extrinsic semiconductors:** N and P type semiconductor, carrier densities, generation and recombination of excess carriers, carrier life time, continuity equation.

**Diode circuits:** The PN junction, biasing and V-I characteristics of diodes , rectifier concept, half wave and full wave rectifiers, Zener diode and voltage regulators.

**Bipolar transistor**: Junction transistors, principles of operation, biasing, characteristics in different configurations (CE, CB & CC), DC and AC load line, transistor equivalent circuits. Gain and impedance, Analysis of small signal low frequency transistor amplifier by using h - parameters.
**Field effect transistor**: Construction of JFET, its parameters, biasing, characteristics and principles of operation, different types of MOSFET and its operation and characteristics.

**Other semiconductor devices**: Thermistor, SCR, UJT, DIAC, TRIAC and micro-electronics devices.

**Amplifier:** Voltage and current amplifiers of different configurations, RC coupled amplifier, operational amplifiers (OPAMPS), linear applications of OPAMPS, gain, input and output impedance.

**Instrumentation amplifiers**: Differential, logarithmic and chopper amplifiers. Noise reduction in instrumentation.

**EEE 1202: Electronic Circuits, Devices and Instrumentation Laboratory**
**Credits: 1.5** **Pre-Requisites: EEE 1102** **Contact Hours: 3 Hours/Week**

Laboratory works based on **EEE 1201**

**MATH 1201: Matrix and Differential Equations**

**Credits: 3.0 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

**Matrix:** Definition of Matrix and different types of matrices; Adjoint and Inverse of matrices; Rank of matrices; Elementary transformation of matrices; Properties of diagonal and unit matrices; Solution of simultaneous equations by matrices; Null matrix and Sylvester's Theorem; The characteristic matrix and the characteristic equation of a matrix; Power series of matrices.

**Introductory Concepts:** Definitions and classifications of differential equations; Solutions – implicit solutions, singular solutions; Problems - Initial Value Problems (IVP), Boundary Value Problems (BVP); Formation of differential equations; Basic existence and uniqueness theorem – statement and applications only. Direction fields; Phase line.

**Solutions of First Order Equations:** Types of Ordinary Differential Equations (ODEs) to be considered; Exact equations; Equations solvable by separation of variables – separable equations; Homogeneous equations; Equations reducible to homogeneous form; Linear equations; Integrating factor; Equations made exact by integrating factor; Burnoulli's equation, and Riccati's equation.

**Solutions of Higher Order Equations:** Basic theory of linear differential equations; Higher order homogeneous linear equations with constant coefficients; Solution space of homogeneous linear equations; Fundamental solutions of homogeneous equations; Reduction of orders; Linear non-homogeneous equations with constant coefficients; Method of undetermined coefficients; Method of variation of parameters; Operator method; Linear equations with variable coefficients; Cauchy-Euler equation; Legendre equation; Operational factoring; Exact equation.

**CHEM 1201: Chemistry**

**Credits: 2 Pre-Requisites: Nil Contact Hours: 2 Hours/Week**

**Crystal symmetry:** Different methods for the determination of structure; Structures of the metallic elements and certain compounds with three dimensional lattices; Defects in solid; Semiconductors: Structures of Si, Ge, B, N, P, In. Types of Semiconductor, Electronic and band theory.

**Solution :** Type of solutions, Units of concentration. Solution of gas in liquid, Henry's law. Solution of solid in liquid, solubility curve. Distribution law and its application. Solvent extraction, Colligative properties of dilute solution.

**Chemical Equilibrium***:* Law of mass-action, Chemical equilibrium and Equilibrium Constants, Application of law of mass-action to Homogeneous and Heterogeneous Equilibrium, Le-Chatelier Principle, Applications of principle of mobile equilibrium to reaction of industrial importance.

**Nuclear Chemistry:** Radioactivity, Patterns of Nuclear Stability, Nuclear Transmutations, Rates of Radioactive Decay, Detection of Radioactivity, Energy Changes in Nuclear Reactions, Nuclear Fission, Nuclear Fusion, Isotopes, Isobar, Isomers, Methods of Separation of Isotopes, Applications of Radioisotopes, Biological Effects of Radiation.

## COURSE DETAILS IN SECOND YEAR 1st SEMESTER

### CSE 2101: Object Oriented Programming

**Credits: 3** **Pre-Requisites:CSE 1201** **Contact Hours: 3 Hours/Week**

**Principle of Object-oriented programming:** Software evolution; A look at Procedure-oriented programming; Object-oriented programming paradigm; Basic concepts of Object-Oriented Programming (OOP); Benefits of OOP. Object-Oriented Programming languages

**Object-Oriented Programming with C++:** Functions in C++; Classes and Objects, Constructors and Destructors, Parameterized Constructors, Friend Functions, Function and Operator overloading and Type Conversions. Inheritance: Single, Multilevel, Multiple, Hierarchical, and Hybrid inheritance; Virtual base classes, Constructor in derived classes; Nesting of classes. Virtual Functions: Pointers to Objects, thispointer, Pointer to derived classes, Virtual Functions, Pure Virtual Functions, Early versus late binding. C++ I/O operations: C++ streams, C++ stream classes, Unformatted console I/O operations, Formatting I/O, Creating manipulator functions, Classes for file stream operations, Opening and Closing a File, Detecting EOF, File pointers and their manipulations, Sequential and Random I/O operations, Error handling during file operations. Templates; Exception handling

### CSE 2102: Object Oriented Programming Laboratory

**Credits: 1.5** **Pre-Requisites: CSE 1202** **Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 2101**

### CSE 2103*:* Computer Architecture and Organization

**Credits: 3** **Pre-Requisites: CSE 1101** **Contact Hours: 3 Hours/Week**

**Fundamentals of Computer Design:** Introduction, definition of performance, job of computer designer, historical perspectives.

**Memory Organization:** Review of primary and secondary memories; memory hierarchies; Internal Memory: Semiconductor main memory, error correction; External Memory: Magnetic disk, RAID, optical memory, High-speed memories, Caches, associative memories. Hard Disk and Drives, Compact Disk and Drives etc.

**System Organization:** Communications: Introduction, bus control; I/O systems: Programmed I/O, DMA and interrupts, I/O processors, Basic concepts of parallel processing.

**RISC and CISC processors:** Introduction, data dependency, addressing modes, condition code, register sets, brief study of standard RISC and CISC processors, RISC versus CISC, Instruction Pipelining, RISC pipelining.

**Instruction-Level Parallelism and Superscalar:** Basic view, design issues.

**CSE 2105: Data Structures and Algorithms**
**Credits: 3 Pre-Requisites: CSE 1201 Contact Hours: 3 Hours/Week**

**Introduction:** Basic Terminology, Elementary Data Organization, Data Structures, Algorithms, and Complexity of Algorithms

**Stacks, Queues and Recursion:** Fundamentals, Different types of stacks and queues: Circular, deques etc.; Evaluation of expressions, Multiple stacks and queues; Recursion, Depth of recursion, Simulation of Recursion, Removal of Recursion; Towers of Hanoi.

**Graphs:** Introduction, definition and terminology, graph representations, traversals, connected components and spanning trees, shortest path and transitive closure.

**Trees:** Basic terminology, Binary trees, binary tree representations, binary tree traversal; Binary search tree, tree search, Insert into a search tree, tree sort algorithm, deletion from a search tree, Building a binary search tree, Inserting a node, Forming a heap;

**Linked Lists:** Single linked lists, Linked stacks and queues, the storage pool, polynomial addition, equivalence relations, sparse matrices, doubly linked lists and dynamic storage management, generalized lists, garbage collection and compaction.

**Extended binary trees:** 2-trees, internal and external path lengths, Huffman codes/algorithm; binary tree representation of trees.

**Sorting andSearching:** Searching, bubble sort, shell sort, insertion sort, selection sort, quick sort, heap sort, 2-way merge sort.

**Hashing:** Hashing, Hashing techniques.

**CSE 2106: Data Structures and Algorithms Laboratory**
**Credits: 1.5 Pre-Requisites: CSE 1202 Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 2105**

**CSE 2108: Lab (C++/Java/C#)**
**Credits: 1.5 Pre-Requisites: CSE 2101 Contact Hours: 3 Hours/Week**

Laboratory works based on **C++/Java/C#**

**EEE 2101: Digital Electronics and Pulse Techniques**
**Credits: 3 Pre-Requisites: EEE 1201 Contact Hours: 3 Hours/Week**

**Wave shaping**: Linear wave shaping, diode wave shaping techniques, high pass and low pass RC circuits (sinusoidal, step voltage, pulse, square wave, exponential and ramp inputs, Clipping and clamping circuits, comparator circuits, ringing circuits.

**Switching and Time-based circuits**: Switching concept of diodes and transistors, pulse transformers, pulse transmission, pulse generation, timing circuits, simple voltage sweeps, linear current sweeps.

**Stable state and regenerative switching** Monstable, bistable and astable multivibrators, use of multivibrators, Schmidt trigger, blocking oscillators.

**Study of logic families:** DL, DTL, ETL, TTL, ECTL, IIL, MOS logic families.

**Electro-optical devices:** S/H circuits, LED, LCD and optically coupled oscillators; Non-linear applications of OP AMPs, analog switches.

**D/A and A/D conversion:** D/A-converter circuitry, DAC specification, and DAC applications. Analog-to-Digital conversion: Digital-ramp, Successive approximation, Flash and tristate ADCs. Digital Voltmeter.

**EEE 2102: Digital Electronics and Pulse Techniques Laboratory**

**Credits: 1.5 Pre-Requisites: EEE 1202 Contact Hours: 3 Hours/Week**

Laboratory works based on **EEE 2201**

**MATH 2101: Geometry and Vector Analysis**

**Credits: 3.0 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

**Three dimensions**

**Introduction to two dimension geometry:** Equation of a line, parallel line, perpendicular line, general equation of a circle.

**Planes:** Different forms of the equations of planes and conversion; Angle between two planes; Distance of a point from a plane.

**Straight Lines:** Different forms of the equations of straight lines and conversion; Relationship between planes and line; Skew lines; Angle between a line and a plane; Coplanar lines; Shortest distance.

**Sphere:** Equations of spheres; A plane and sphere; A line and sphere; Plane of contact; Tangent planes; Polar planes; Angle of intersection of two spheres; Condition of orthogonality; Radical line; Coaxial spheres.

**Vector Analysis:** Transformation of vectors: scaling, rotation, translation; Dependence and independence of vectors; Differentiation of vectors together with elementary applications; Gradient, divergence and curl of point functions; Integration of vectors together with elementary applications; Concepts of line, surface and volume integrals; Introduction to Stoke's theorem, Green's theorem and Gauss's theorem.

## COURSE DETAILS IN SECOND YEAR 2nd SEMESTER

### CSE 2201: Algorithm Analysis and Design

**Credits: 3** **Pre-Requisites: CSE 2105** **Contact Hours: 3 Hours/Week**

Techniques for analysis of algorithms, divide and conquer, greedy method, dynamic programming, backtracking, branch and bound, graph algorithms, NP-hard and NP-complete problems.

### CSE 2202: Algorithm Analysis and Design Laboratory

**Credits: 1.5** **Pre-Requisites: CSE 2106** **Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 2201**

### CSE 2203: Operating System

**Credits: 3** **Pre-Requisites: Nil** **Contact Hours: 3 Hours/Week**

**Introduction:** Evolution, Goals and Components of OS, Types of OS. Operating System Services

**Process management:** Process states and state transition, Process Control Blocks, Job and Process scheduling, Process Communication, Threads

**CPU Scheduling:** Scheduling levels, Objectives and criteria, CPU scheduling algorithms, Algorithm Evaluation

**Process Synchronization:** Process co-ordination, Critical section problems, Semaphores, Monitors, Classical problems of process synchronization.

**Deadlock:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock prevention, avoidance, and detection, Recovery form deadlock, Deadlock handling.

**Memory management:** Logical and Physical Address Space, Swapping, Memory allocation schemes, Paging and Segmentation, Segmentation with Paging

**Virtual memory:** Demand paging, Performance of Demand Paging, Page replacement algorithms, Allocation of frames, Demand Segmentation

**Secondary storage management:** Disk structure; Disk scheduling, Disk management, Swap-space management, Disk reliability, Stable storage implementation

**File-System:** File and Directory concept, File system structure, Allocation method, Free space Management, Directory Implementation.

**Protection and Security:** Goals of protection, principle of protection, Access matrix, Access Control, Security problems and Threats, Computer Security, Implements Security Defenses,

**CSE 2204: Operating System Laboratory**
**Credits: 1.5 Pre-requisite: Nil Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 2203**

**CSE 2205: Database System**
**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

**Introduction to Database System:** Purpose of database systems, View of Data, Data Models & Languages, Database Administrator & Users, System Structure

**Entity-Relationship Model:** Basic Concepts, Design issues, mapping constraints, keys, weak entity sets, E-R diagram and its extended features, design of an E-R database schema, reduction to table

**Relational Model:** Structure of Relational Database, Relational Algebra, Extended Relational-Algebra Operations, Modification of the database, Views.

**Structure Query Language:** Background,Basic Structure: Set, Aggregate Functions, Null Values, Nested Subqueries, Derived Relation, Views, Modification, joined relations, DDL.

**Integrity Constraints:** Domain Constraints, Referential Integrity, Assertions, and Triggers.

**Functional Dependency:** atomic domain,First normal form, keys and functional dependencies, BCNF,3NF, 4NF, Higher Normal forms.closure of a set of functional dependencies, closure of attribute sets, canonical cover, lossless decomposition, decomposition using functional dependencies.

**Data Storage structure:** Overview of physical storage, RAID, File organization and record organization in a File, Data Dictionary storage.

**Indexing and Hashing:** Basic concepts, Ordered Indices, B+ tree, B tree, Hashing, Index definition in SQL.
**Transaction:** Transaction concept, Transaction State, Implementation of Atomicity & Durability, Concurrent execution, Serializability, Recoverability, Transaction in SQL.

**CSE 2206: Database System Laboratory**
**Credits: 1.5 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 2205**

**CSE 2207: Probability and Statistics**

**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

**Preliminaries:** Definition of Statistics, Its necessity & importance, Population and Sample, Variable and Constants, Different types of variables, Statistical data, Data Collection and presentation, Construction of Frequency distribution, Graphical presentation of Frequency distribution.

**Measures of Central Tendency:** Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Mode, Weighted Mean, and Theorems & Problems.

**Measures of Dispersion**: Range, Standard Deviation, Mean Deviation, Quartile Deviation, Variance, Moments, Skew ness and Kurtosis, Theorems & Problems.

**Correlation Theory:** Linear Correlation - Its measures and significance, Rank Correlation, Theorems & Problems.

**Regression Analysis:** Linear and non-linear regression, Least-square method of curve fittings, Theorems & Problems.

**Probability:** Elementary Concepts, Laws of Probability – Additive and Multiplicative Law, Conditional Probability and Bay's theorem, Random Variables, Mathematical Expectation and Variance of a random variable, Theorems & Problems.

**Probability Distributions:** Binomial distribution, Poisson distribution and Normal distribution – Their properties, uses, Theorems & Problems.

**CSE 2208: Probability and Statistics Laboratory**

**Credits: 1.5 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 2207**

**MATH 2201: Linear Algebra, Fourier Transform and Complex Variables**

**Credits: 2 Pre-Requisites: Nil Contact Hours: 2Hours/Week**

**Fourier Series:** Fourier Coefficient, sine and cosine series, Dirichlet's Theorem, Properties and Application.

**Fourier Transform:** Fourier sine and cosine transforms, complex Fourier transform, Convolution Theorem, Application to boundary value problem.

**CSE 2200: Viva-Voce**

**Credits: 1.0**

Exam committee will take viva-voce based on the courses of second year 1st and 2nd semester.

## COURSE DETAILS IN THIRD YEAR 1st SEMESTER

**CSE 3101: Numerical Methods**
**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

**Numbers and errors:** Significant figures. Absolute and relative error. Rounding. Error in functional evaluation. Propagation of error in arithmetic process. Single non-linear equ: Picard iteration. Neuton Raphson method Convergence.Interpolation: Difference tables. Newton forward and backward interpolation formulae with error. Divided difference and central difference formulae. Lagranges Interpolation formula. Numerical differentiation. Numerical integration by Trapezoidal rule. Simpson's rule. Rhomberg rule with error. Curve fitting by least squares. Cubic spline. Chebyshev polynomials. Minmax properties.

**Differential equations:** Modified Euler method . Runge –Kutta method. Predictor corrector method, Linear algebraic systems, Direct and iterative methods, Matrix inversion.

**Eigen Values and Eigen Vectors:** Introduction and concept of eigen value and eigen vector. Solution of homogeneous linear system. Estimation of the size of Eigen values.

**CSE 3102: Numerical Methods Laboratory**
**Credits: 1.5 Pre-Requisites: CSE 2102 Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 3101**

**CSE 3103: Microprocessors and Assembly Language**
**Credits: 3 Pre-Requisites: CSE 2103 Contact Hours: 3 Hours/Week**

**Introduction:** Microprocessors and microcomputers; Evolution of microprocessors; microprocessor applications; Programming Languages; General architecture of microprocessor; The Memory; Input/Output; Co-processors.

**Assembly Language Programming:** Introduction to Assembly Language Programming, Addressing Modes, Machine & Assembly instruction types & their formats; Character representation instructions; Instruction execution; Control structures, Subroutines, Interrupt, Macros & files; I/O programming; Assembler.

**Intel 8086 microprocessor:** Internal architecture; Register structure; Programming model; Addressing modes, Instruction set; Programming; Memory subsystem; Bus timing and standards, Co-processors interfacing, Inter-processors communication.

**Overview of Other Processors:** Intel 80186, 80286, 80386, 80486 & Pentium microprocessors and other advance processors; Motorola 68000, Dual Core, Core to Duo, Core i3, Core i5, Core i7, Quad Core, Atom, Processors in cell phones.

**CSE 3104: Microprocessors and Assembly Language Laboratory**
**Credits: 1.5 Pre-Requisites: CSE 2104Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 3103**

**CSE 3105: Data Communication**
**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

**Data and Signals Overview**: Introduction, a Communication Model, fundamentals of data communication, reference models, basic concepts and terminologies of data and signal, transmission impairments.

**Digital and Analog Transmission:** Line coding, block coding, sampling, quantization, modulation techniques.

**Transmission Media:** Twisted pair, coaxial cable, fiber optic cable, radio waves, microwaves, infrared, and satellite communication.

**Data communication Interface:**Serial and parallel transmission, Asynchronous and Synchronous Transmission, Simplex, half-duplex and full-duplex communications, interface standards: RS-232 interface, Null modems, RS-449 interface, X.21 interface.

**Digital Data communication Technique**: Asynchronous and synchronous transmission, line configuration and interfacing

**Error Detection and correction:** Types of error, error detection and error correction techniques.
**Data Link Control:** Flow control techniques and high-level data link control

**Multiple access and Multiplexing:** Random access, controlled access, channelization, Frequency division multiplexing, Time division multiplexing and other multiplexing techniques.

**Switching Techniques and mobile telephone systems:** Circuit switching; message switching, packet switching, virtual circuits, frame relay, generations of mobile telephone systems.

**CSE 3106: Data Communication Laboratory**
**Credits: 1.5 Pre-Requisites: CSE 2104Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 3105**

**CSE 3107: Software Engineering**
**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

**Introductory concepts:** Classification of software products; Software products attributes; The need of software engineering; System concepts and the information systems environment, information needs, the concept of MIS, the system development life cycle, the role of system analyst.

**System analysis and design:** System planning and the initial investigation, information gathering, feasibility study, cost/benefit analysis. The process and stages of systems design, input/output design, organization and data base design, SDLC, OO design, system testing.

**Software Process:** Software engineering process, methods; Generic view of software engineering; Software process models..

**Requirements and Specification:** Requirements Engineering; Requirements analysis; System models; Requirements definition and specification; Software prototyping; Model-based specification.

**Project Management:** Overview and importance of project management; Project management activities; Project planning.

**Software metrics:** Measuring software; Lines of Code and Function Points; Metrics and software quality.

**Risk Analysis and Management:** Reactive versus proactive risk strategies; Software risks; Risk identification; Risk projection; Risk refinement.

**Verification and Validation:** Software Quality, Software testing fundamentals; Testing methods and strategies, Version control.

**CSE 3108: Software Engineering Laboratory**
**Credits: 1.5 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 3107**.

**CSE 3109: Theory of Computation**
**Credits: 3 Pre-Requisites: Nil Contact Hours: 2 Hours/Week**

**The Central Concepts:** Introduction to Finite State Machines and Finite State Automata; Alphabets, Strings and Languages.

**Finite Automata:** Deterministic Finite Automata, Non-deterministic Finite Automata, and their applications; Finite Automata with Epsilon-Transitions.

**Regular Expressions and Languages:** Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions, and Algebraic Laws for Regular Expressions.

**Properties of Regular Languages:** The Pumping Lemma for Regular Languages and its applications; Closure Properties and Decision Properties of Regular Languages; Equivalence and Minimization of Automata.

**Context-Free Grammars and Languages:** Context-Free Grammars; Parse Trees; Applications of Context-Free Grammars; Ambiguity in Grammars and Languages, Chomsky and Greibach Normal forms for CFG's; The Pumping Lemma for CFL's; Closure and Decision properties of CFL's.

**Pushdown Automata:** Definition and the languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata.

**Introduction to Turing Machines:** The Turing Machine, Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine, Restricted Turing Machines, Turing Machines and Computers.

**CSE 3110: Web Development Laboratory**

**Credits: 1** **Pre-Requisites: Nil** **Contact Hours: 2 Hours/Week**

**CSE 3100: Project(RDBMS)**

**Credits: 1** **Pre-Requisites: Nil** **Contact Hours: 2 Hours/Week**

## COURSE DETAILS IN THIRD YEAR 2ND SEMESTER

### CSE 3201: Computer Network

**Credits: 3 Pre-Requisites: CSE 3105 Contact Hours: 3 Hours/Week**

**Introduction:**Uses of computer networks, open systems & the OSI model, TCP/IP reference model, network standardization, categories of networks, connecting devices.

**Local Ares Networks:** Network topologies, Ethernet, Token ring, FDDI.

**Network Layer Issues:** Internetworking and addressing, network layer protocols, routing, NAT, ARP.

**Transport Layer Issues:** Basic concepts, transport layer protocols, congestion control, quality of services.

**Internet Application:** Client-server interface, email, file transfer, DNS, HTTP, WWW, network management protocols.

**ISDN:** Motivation and protocol for ISDN, ISDN standard, Expert system in ISDN. ISDN channel and broadband ISDN. Transmission channel, Signaling, Numbering and addressing of ISDN.

**Security:** Cryptography, Symmetric-key Algorithm, Digital signature, Communication Security, Web security etc.

### CSE 3202: Computer Network Laboratory

**Credits: 1.5 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 3201**

### CSE 3203: Compiler Design

**Credits: 3 Pre-Requisites: CSE 3107 Contact Hours: 3 Hours/Week**

**Introduction:** Phases of a compiler (lexical analyzer, syntax analyzer, semantic analyzer, intermediate code generator, code optimizer, code generator, symbol-table manager & error handler), overview of C, C++, Java, C# compilers.

**Lexical analysis:** Role, finite automata, from regular expression to NFA, from NFA to DFA.

**Syntax analysis:** Role, CFG, writing a grammar, top-down parsing, bottom-up parsing, operator precedence parsing, LR parser, using ambiguous grammar. Symbol table, structure and management.

**Intermediate code generation:** Intermediate languages, declarations, assignment statement, Boolean expression, case statements, back patching, procedure calls.

**Code optimization:** Principle of source optimization, optimization of basic blocks, loop in flow graphs, global data flow analysis, iterative solution of data flow equations.

**Code generation:** Issues in the design of a code generator, target machine, runtime storage management, basic blocks and flow graphs, register allocation and assignment, dag representation of basic blocks, peephole optimizations, generating code from dags.

**CSE 3204: Compiler Design Laboratory**
**Credits: 1.5 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 3203**

**CSE 3205: Peripheral and Interfacing**
**Credits: 3 Pre-Requisites: CSE 3103 Contact Hours: 3 Hours/Week**

**Input/Output Devices:** Digitizer, Scanners, OCR, bar codes, Magnetic card readers, touch screens, Printers, Monitors, Mouse, Keyboard etc.

**Interfacing between Computer and IO Devices:** Sensors, transducers and signal conditioning, Interfacing Memory and I/O Devices such as monitors, printers, keyboard, disk drives, Data acquisition and some other smart interface cards; IEEE488 and other buses and interfacing scientific instruments. Study of Microcomputer's chips.

**Microprocessors Supporting Chips:** 8155, 8255, DMA controller etc.

**Interfacing real worlds:** Display of decimal & alphanumeric character, Measurement of electrical quantities - frequency, voltage, current etc. Temperature, water level & motor speed measurement. Traffic control.

**CSE 3206: Peripheral and Interfacing Laboratory**
**Credits: 1.5 Pre-Requisites: CSE 3105 Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 3205**

**CSE 3207: Digital Signal Processing**
**Credits: 2 Pre-Requisites: Nil Contact Hours: 2 Hours/Week**

**Introduction to Signals:** Concepts of signals, systems and signal processing; classification of signals; Digital signals and systems; Classification of discrete time signals; Sampling theorem; Fourier series and Fourier transform; Autocorrelation.

**The Z-Transform**: The Z-Transform and its properties; The inverse Z-Transform.

**The Discrete Fourier Transform (DFT):** The Discrete Fourier Transform (DFT), redundancy in the DFT; The Fast Fourier Transform (FFT); the FFT decimation in time & decimation in frequency; Interrelationship between the DFT & Z-transform; Convolution of sequences & sectioning.

**Digital Filter:** Digital Filter characterization; Digital filter structures; Design of Digital Filters; Recursive Filter design; Effects of finite word length; Simple models for quantization noise in recursive systems; Non-recursive filter design via the DFT computational techniques; Other radix formulations; Other radix formulations; Spectral analysis using the FFT; Speech processing algorithms;

**CSE 3208: Digital Signal Processing Laboratory**

**Credits: 1 Pre-Requisites: Nil Contact Hours: 2 Hours/Week**

Laboratory works based on CSE 3209

**CSE 3209: Accounting and Information System**

**Credits: 2 Pre-Requisites: Nil Contact Hours: 2 Hours/Week**

**Accounting:** Basic accounting, Classification of account, Journal, Ledger, Cash book, Trial Balance, Final account.

**Cost Accounting:** Definition and objectives; Elements of a costs; Preparation of a cost sheet,

**Marginal costing:** Break even analysis, Process costing.

**CSE 3200: Viva-Voce**

**Credits: 1.0**

Exam committee will take viva-voce based on the courses of third year 2nd semester.

## COURSE DETAILS IN FOURTH YEAR 1st SEMESTER

**CSE 4101: Artificial Intelligence**
**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

**Introduction:** Definition of AI, Historical Development of AI, Applications of AI. AI Techniques,

**Logic:** Prepositional Logic, First-order logic, Resolution principle,

**Problem Representation:** State-space Representation, Problem-reduction representation,

**Production Systems:** PS structure, Recognition-Action Cycle, Inference Directions, Blackboard systems, PS implementation.

**Frame Representation:** Basic structure, Inheritance of properties, Slot Extension implementation.

**Search:** Blind and non-blind searches, Depth-first search, Breadth-first search, Heuristic search, Best-first search, Optimal search, A search implementation complexity.

**Fuzzy Knowledge:** Probability theory, Dempster-shafer theory, Fuzzy set theory, Expert systems,

**Natural Language Processing:** Syntactic Semantics and Pragmatic, Top-down pursing, Bottom-up pursing, Lexicon, First Order Logic, Second Order logic.

**CSE 4102: Artificial Intelligence Laboratory**
**Credits: 1.5 Pre-Requisites: Nil Contact Hours: 3.0 Hours/ Week**

Laboratory works based on **CSE 4101**

**CSE 4103: Simulation and Modeling**
**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

**Introduction:** Concepts of a system; System Environment; Activities; Continuous and Discrete Systems.

**System Modeling:** Introduction to modeling; Types of models – Static Physical Models, Dynamic Physical Models, Static Mathematical Models, Dynamical Mathematical Models; Principles used in Modeling.

**System Studies:** Subsystem concepts; A corporate model – Environment Segment, Production Segment, Management Segment; Types of System Study – System Analysis, System Design, and System postulation.

**System Simulation:** The Technique of Simulation; Comparison of Simulation and Analytical Methods; Experimental Nature of Simulation; Parallel and Distributed Simulation; Real time Simulation Types of System Simulation;

**Probability Concepts in Simulation:** Stochastic Variables; Discrete and Continuous Probability Functions; Measures of Probability Functions; The Coefficient of Variation; Generation of Random Variates; Binomial Distribution; Poisson Distribution; Continuous Distribution; Normal Distribution; The Exponential Distribution; The Erlang and Hyper-Exponential Distributions; Uniform Distribution; Beta Distribution.

**Random Numbers:** Random Numbers Table; Pseudo Random Numbers; Computer Generation of Random Numbers; A Uniform and non-Uniform Continuously Distributed Random Numbers; Qualities of an efficient Random Number Generator.

**Arrival Patterns and Service Times:** Congestion in Systems; Arrival Patterns; Service Times; Queuing Disciplines, Measure of Queue and Mathematical Solutions of Queuing Problems.
**Discrete System Simulation:** Discrete Events; Representation of Time; Generation of Arrival Patterns; Simulation of a Telephone System; Simulation.

**Analysis of Simulation Output:** Nature of the Problem; Verification and Validation of Simulation; Estimation Methods.

**CSE 4104: Simulation and Modeling Laboratory**
**Credits: 1.5 Pre-Requisites: Nil Contact Hours: 3.0 Hours/ Week**

Laboratory works based on **CSE 4103**

**CSE 4105: Image Processing**
**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

**Image processing:** Image perception, sampling & quantization, transforms, representation, enhancement, filtering and restoration, edge detection and histogram, image analysis and computer vision, image reconstruction.

**CSE 4106: Image Processing Laboratory**
**Credits: 1.5 Pre-Requisites: Nil Contact Hours: 3.0 Hours/ Week**

Laboratory works based on **CSE 4105**

**CSE 4107: Parallel and Distributed Processing**
**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

**Parallel Processing:** Importance, architecture, Hardware and software issues; Architectures for parallel processing - Classifications

**Comparative Study of Different Architectures:** Hardware issues in parallel processing, parallel programming

**Distributed Processing:** Definition, Impact of distributed processing on organizations, pitfalls in distributed processing

**Forms of Distributed Processing:** Function distribution, Hierarchical distributed systems, Horizontal distributed systems

**Strategy:** strategies for distributed data processing, control of complexity, problem of incompatibility, centralization vs. decentralization, cost and benefit analysis

**Design of Distributed Data:** distributed data, location of data, multiple copies data, conflict analysis, database management, distributed databases and applications

**CSE 4109: Information Security and Control**

**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

Introduction to Information Security, Aspects(goals) of Security, Mechanisms of Security; Cryptography: Terminology and Background, Symmetric & Asymmetric Cryptography, Encryption Algorithms, Cryptanalysis, Uses of encryption; Program Security: Secure Programs, Viruses and other Malicious Codes, Controls against Program Threats; Operating System Security: Protected Objects and Methods of Protection, Memory and Address protection, Control of Access to General Objects, File Protection Mechanisms, User Authentication; Identification and User Authentication, Password Authentication Schemes, Access Control Schemes.

Database Security: Security Requirements, reliability and Integrity, Sensitive data, Inference, Multilevel Databases, Proposals for Multilevel Security; Security in Networks: Threats in Networks, Network Security Controls, Firewalls, Intrusion Detection System, Secure E-Mail; Legacy, Privacy and Ethical Issues in Computer Security: Protecting Programs and Data, Information and the Law, Rights of Employers and Employees, Software Failures, Computer Crime, Privacy, Ethical Issues in Computer Security, Case Studies of Ethics; Administering Security: Security Planning, Risk Analysis, Organizational Security Policies, Physical Security.

**CSE 4110: Mobile Apps Development Laboratory**

**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

**CSE 4000: Project/Thesis**

**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

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

**NB: The Courses CSE 4000 of 1st semester and CSE 4000 2nd semester should be evaluated combinedly after completing CSE 4000 of 2nd semester**

## COURSE DETAILS IN FOURTH YEAR 2nd SEMESTER

**CSE 4201: Computer Graphics and Multimedia**
**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

**Introduction to Computer Graphics:** Introduction, Presentation graphics, Application Areas, GUI; Graphics Hardware: Display devices Architecture and Input Devices;

**Graphic Primitives:** Drawing Points, Lines, Circles, Ellipse, Rectangles, Arcs; Polygons: Inside-outside tests, polygon fill algorithms, Character generation;

**Two-dimensional Viewing and Clipping:** Viewing pipeline, Window to view port transformation, Point, Line, Polygon, Curve and Text clipping;

**Transformations of Objects:** Basic transformations, Affine Transformations, Translations, Rotations, Scaling, reflection and Shearing, Composite transformations matrices, Transformation of 3D objects (4×4 matrices).

**Curve and Surface design:** Interpolation and approximation techniques, B-spline, Bezier curves and Surfaces, Fractal Geometry
**3D Object Representation:** 3D Graphics Pipeline, Projection: Different types of Parallel and Perspective Matrices; B-Rep, Constructive Solid Geometry, BSP tree, Octree, Hidden lines and Surface detection: Back face Detection, Painters algorithm, Z-buffering; light models,

**Illumination Models and Surface-Rendering:** Basic illumination models, ambient light, diffuse reflection, specular reflection, Constant, Goraud and Phong shading; Ray-tracing; Different Types of Color Model, Fractals and Texture Mapping.

**CSE 4202: Computer Graphics and Multimedia Laboratory**
**Credits: 1.5 Pre-Requisites: CSE 2102 Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 4201.**

**CSE 4203:Pattern Recognition and Neural Computing**
**Credits: 3.0 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

**Pattern Recognition:** Introduction, importance; Statistical and Neural Pattern Recognition: Bayesian classifier, Bayes decision theory, discriminator functions and decision surfaces;

Bayesian classifier for normal distributions; Parametric and non-parametric classification methods, Linear classifiers: discriminator functions and decision hyper-planes; Perceptron algorithm and its variants, Kessler's construction: Nonlinear classifiers: two and three layer perceptron, back-propagation algorithm and its variants.

**Template Matching:** Optimal path searching techniques, Dynamic programming methods, Correlation based matching and 2D log search algorithm for image matching;

**Context dependent classification:** Viterbi algorithm, channel equalization, observable and hidden Markov models, three problems of HMM and their application in speech recognition;

**Syntactic pattern Recognition:** Introduction to Syntactic pattern Recognition, grammar-based approach, parsing, graph-based approach; Unsupervised classification: basic concepts of clustering, proximity measures, categories of clustering algorithms, sequential clustering algorithms; Feature extraction for representation and classification; Models of cognition, learning, computer vision.

**Introduction to Neural Networks:** The Basic Neuron, The Multi-layer Perception, Applications of Neural Network, Kohonen Self-Organizing Networks, Hopfield Networks, Adaptive Resonance Theory, Associative Memory. Pattern Recognition by Neural Network theory

**CSE 4205: IT Organization, Management and Professional Ethics**
**Credits: 3.0 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

Laboratory based on Egoism and Relativism, Rationalist Ethics, The Ethics of Character and Virtue, Ethics and Religion, Ethics and Culture, Professional Ethics Codes. Morality and moral thoughts, Responsibility, Interpersonal moral sentiments (anger, blame,shame, guilt and praise), Reason, Emotion, and Intuition in Moral Judgment, Confidentiality, privacy and harassment.

**CSE 4210: Industrial Tour**
**Credits: 1.5 Pre-Requisites: CSE 2102 Contact Hours: 3 Hours/Week**
Laboratory works based on Computer Business Related Industry visit**.**

**CSE 4000: Project/Thesis**
**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

Continuation of project/thesis topic is undertaken in CSE 4000.

**NB: The Courses CSE 4000 of 1st semester and CSE 4000 2nd semester should be evaluated combined after completing CSE 4000 of 2nd semester**

**CSE 4200: Viva-Voce**
**Credits: 1.0**

Exam committee will take viva-voce based on the courses of fourth year 2nd semester .

**OPTIONAL COURSES:**

**CSE 4207: VLSI Design**

**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

A Historical Perspective; Issues in VLSI Design; CMOS Logic (Inverter, Conditional Logic, NAND, NOR, Compound gates, Multiplexers, Memory --Latches and Registers. Circuit and System Representations and Examples

MOSFET Transistor; MOS Device Design Equations; CMOS Inverter and Bipolar Devices. Silicon Semiconductor and Basic CMOS Technology; CMOS Process Enhancements; Layout Design Rules and Latch up.

CMOS Logic Gate Design; Basic Physical Design of Simple Logic Gates; CMOS Logic Structures; Clocking Strategies and I/O Structures

Circuit Characterization and Performance Estimation (Resistance Estimation, Capacitance Estimation, Inductance, Switching Characteristics, Power Dissipation, Charge Sharing, Scaling of MOS Transistors Dimensions) and CMOS Design Methods (Design Strategies, CMOS Chip design options, Design Methods, Design Capture Tools, Design Verification Tools, Design economics)

Need for Testing, Manufacturing Test Principles, Design Strategies for Test, Chip Level and System Level Test Techniques

CMOS Subsystem Design (Data path Operations, Memory elements and Control); A Core RISC Micro controller Design; Major Logic Blocs Design and A 6-bit Flash A/D Design

Recommended Text:

1. Introduction to VLSI design, Author: Fabrcius
2. VLSI Technology 2nd Edition, Author: Simon Sze.
3. VLSI, Technology and Design, Author: Otto G. Folberth, Warren D. Grobman
4. VLSI design tech. for analog and digital ckt, Author: Geiger

**CSE 4209: Basic Graph Theory**

**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

Introduction, Paths and Circuits, Trees, Cut-set and Cut-vertices, Planar and dual graph, vector space of a graph, Matrix representation of a graph, Coloring, covering and portioning, directed graph, enumeration of a graph.

**CSE 4211: Introduction to Bioinformatics**

**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

Introduction, Molecular biology basics, DNA, RNA, genes and Proteins, Restriction mapping algorithm, Motif in DNA sequences, motif finding algorithms, Genome rearrangements, sorting by reversals and breakpoints, DNA sequence alignments, Gene prediction, Space efficient sequence alignments, sub-quadratic alignment, DNA sequencing, genome sequencing, protein sequencing, spectrum graphs.

**CSE 4213: Data Warehousing and Mining**

**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

Introduction; Data warehousing and OLAP technology for data mining; Data preprocessing; Data mining primitives, languages and systems; Descriptive data mining: characterization and comparison; Association analysis; Classification and prediction; Cluster analysis, Mining complex types of data; Applications and trends in data mining.

Recommended Text:

1. Data Mining Concept and Techniques, Authors: Jiawei Han, Micheline Kamber, Jian Pei
2. Data Mining Techniques, Authors: Michael J.A. Berry, Gordon S.Linoff, WILEY
3. Data Warehousing : Data Mining & OLAP, Authors: Berson

**CSE 4215: Cryptography**

**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

Classical cryptography: Intro to simple cryptosystems (Shift Cipher, Substitution Cipher, Hill Cipher, Permutation Cipher etc.), Cryptanalysis; Shanon's Theory: Perfect Secrecy, Entropy, Perfect Cryptosystems; The Data Encryption Standard: Description, Modes of operation, Differential Cryptanalysis; RSA System and Factoring: Intro to Public-key cryptography, The RSA cryptosystem, Attacks on RSA, Factoring Algorithms; Other Public key cryptosystems: The ElGamal cryptosystem and discrete Logs, The Merkle-Hellman Knansack System; Signature Schemes: The ElGamal Signature Scheme, The Digital Signature Standard, FailStopSigntures; Hash Functions: Signatures and Hash Functions, Collision-Free Hash Functions, TheBirthday Arrach; Key Distribution & Key Agreement: Key Pre-distribution, Kerboros, DiffieHellmanKeyExchange; Identification Schemes: The Schnorr Identification Scheme, The Okamoto Identification Schemes; Authentication Codes: Computing Deception Probabilities, Combinatorial Bounds, Entropy Bounds; Secret Sharing Schemes: The Shamir Threshild Scheme, Access Signatures and General Secret Sharing; Pseudo Random Number Generation: Indistinguishable Probability Distribution; Zero Knowledge Proofs: Interactive Proof Systems, Computation Zero knowledge proofs.

Recommended Text:

1. Cryptography and Network Security Principles and Practices, Author: William Stallings. Publisher: Prentice Hall
2. Cryptography Engineering: Design Principles and Practical Applications 1st Edition, Author: Niels Ferguson, Bruce Schneier, Tadayoshi Kohno

Introduction to Modern Cryptography, Second Edition (Chapman & Hall/CRC Cryptography and Network Security Series),Author: Jonathan Katz (Author), Yehuda Lindell

**CSE 4217: Management Information System**

**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

**CSE 4219: Pattern Recognition and Computer Vision**

**Credits: 3 Pre-Requisites: Nil Contact Hours: 3 Hours/Week**

Introduction:Pattern and feature, Problems in pattern recognition, Design concepts and methodologies, Classification techniques, Minimum distance pattern classifier, Training and learning in Pattern recognition approaches-Neural pattern recognition, Pattern recognition tasks by feed forward neural networks.

Statistical Pattern Recognition: Gaussian model-Supervised learning-Parametric and non-Parametric estimation-Maximum likelihood estimation-Bayesian parameters estimation-Perception algorithm-LMSE algorithm-Problems with Bayes approach-Pattern classification by distance functions.

Cluster Analysis: Unsupervised learning-Clustering for Unsupervised learning and classification-K-means algorithm-Hierarchical procedures-Graph theoretic approach to pattern clustering-Validity of clustering solutions.

Syntactic Pattern Recognition: Elements of formal grammar-String generation as pattern description-Recognition of syntactic description-Parsing-Stochastic grammar and applications-Graph based structural representation.

Feature Extension and Recent Advances: Entropy minimization - Karhunen-Loeve transformation-Neural Network structures for pattern recognition-Unsupervised learning -self organizing networks-Fuzzy pattern classifiers-Genetic algorithms-Application to pattern recognition. Hidden Markov Model (HMM).

Biometric system: Biometric behavioral features and physical features, person identification system.

Computer Vision:Definition, Image formation in the eye and the camera, Geometric camera models and calibration, color and color models, early level vision – edge/object/shape detection, motion, mid level vision – segmentation and tracking, model based vision.

Recommended Texts:

1. Anatomy of LISP, Author: Allen.
2. Knowledge-Based Systems in Artificial Intelligence, Author: Davis and Lenat.
3. Problem-Solving Methods in Artificial Intelligence,Author: Nielsen
4. The Elements of Artificial Intelligence, Author: Steven L. Tanimoto
5. Artificial Intelligence, Author: Rich

**CSE 4221: Network Security**

**Credits: 3** **Pre-Requisites: Nil** **Contact Hours: 3 Hours/Week**

Security: Concepts and principles of system and data security. Risks and vulnerabilities, policy formation, controls and protection methods, database security, encryption, authentication technologies, host-based and network-based security issues, personnel and physical security issues, issues of law and privacy. Firewall design and implementation, secure Internet and intranet protocols, and techniques for responding to security breaches.

Recommended Texts:

1. Advanced Computing, Networking and Security, Author: P. Santhi Thilagam, Alwyn Roshan Pais, K. Chandrasekaran, VINOD KRISHAN.
2. Security and Privacy in Advanced Networking Technologies, Author: Borka Jerman-Blažič, Wolfgang S. Schneider, Tomaž Klobučar.
3. Guide to Computer Network Security, Author: Joseph Migga Kizza
4. Computer Network Security, Author: Joseph Migga Kizza

**CSE 4223: Digital Forensic Science**

**Credits: 3** **Pre-Requisites: Nil** **Contact Hours: 3 Hours/Week**

**Introduction:** Forensic Science, Digital Forensics / Digital Forensic Science,**Digital Forensics Branches:** Computer Forensics, Memory Forensics, Network Forensics, Mobile Devices Forensics, Database Forensics, Forensic Data Analysis, Anti-Digital Forensics.**Digital Forensic Process:** Acquisition or Imaging of Exhibits, Analysis, and Reporting.**Digital Evidence:** Digital Forensics Framework (DFF),Rules of Digital Evidence Collection, Preservation of Digital Evidence.**Digital Forensics Tools:** Computer Forensics Tools, Memory Forensics Tools, Network Forensics Tools, Mobile Devices Forensics Tools.**Anti DigitalForensics Tools:** Basic level uses of various tools.**Steganography:** Classification of Steganography Techniques, Steganography Tools, Steganalysis, Steganographic File Systems, Steganography Applications.**Fingerprint Forensics:** Introduction, Classification, Techniques, Tools, and Applications.**Audio-Video Forensics:** Introduction, Classification, Techniques, Tools, and Applications.**Others:** Application, Legal Considerations, and Limitations of Digital Forensics. Digital Forensics Certifications.

**CSE 4224: Digital Forensic Science Laboratory**

**Credits: 1.5** **Pre-Requisites: CSE 2102** **Contact Hours: 3 Hours/Week**

Laboratory works based on **CSE 4223.**

**CSE 4225: Nano Technology**

**Credits: 3** **Pre-Requisites: Nil** **Contact Hours: 3 Hours/Week**