Mawlana Bhashani Science and Technology University

Department of Computer Science & Engineering (CSE)

Syllabus for the degree of B.Sc. Engg. (CSE) [Proposed]

(Effective from academic session 2010-2011)

COURSE REQUIREMENTS FOR UNDERGRADUATE STUDENTS OF THE DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (CSE):

Undergraduate students of Department of CSE have to follow a particular course schedule, which is given below according to semester-wise distribution of the courses:

First Year First Semester

Course Code	**Course Title**	**Class hours/week**		***Credit***
		Theory	**Lab**	
CSE1101	Computer Basics & Programming Fundamentals	3.00	0.00	3.00
CSE1102	Computer Basics & Programming Fundamentals Lab	0.00	3.00	1.50
CSE1103	Electrical Circuit Analysis	3.00	0.00	3.00
CSE1104	Electrical Circuit Analysis Lab	0.00	2.00	1.00
CSE1105	Mathematics I (Differential Calculus , Vector Analysis, Coordinates Geometry)	3.00	0.00	3.00
CSE1107	English	3.00	0.00	3.00
CSE1109	Economics & Sociology	3.00	0.00	3.00
		15.00	**5.00**	**17.50**

First Year Second Semester

Course Code	**Course Title**	**Class hours/week**		**Credit**
		Theory	**Lab**	
CSE1201	Electronic Devices and Circuits	3.00	0.00	3.00
CSE1202	Electronic Devices and Circuits Lab	0.00	2.00	1.00
CSE1203	Structured Programming	3.00	0.00	3.00
CSE1204	Structured Programming Lab	0.00	3.00	1.50
CSE1205	Discrete Mathematics	3.00	0.00	3.00
CSE1207	Physics	3.00	0.00	3.00
CSE1209	Chemistry	2.00	0.00	2.00
CSE1211	Mathematics II(Integral Calculus, Ordinary Differential Equation, Partial Differential Equation, Series Solution)	3.00	0.00	3.00
		17.00	**5.00**	**19.50**

Second Year First Semester

Course Code	**Course Title**	**Class hours/week**		**Credit**
		Theory	**Lab**	
CSE2101	Object Oriented Programming	3.00	0.00	3.00
CSE2102	Object Oriented Programming Lab	0.00	3.00	1.50
CSE2103	Data Structure	3.00	0.00	3.00
CSE2104	Data Structure Lab	0.00	3.00	1.50
CSE2105	Digital Electronics	3.00	0.00	3.00
CSE2106	Digital Electronics Lab	0.00	2.00	1.00
CSE2107	Mathematics III (Matrix, vector, Special Function)	3.00	0.00	3.00

CSE2109	Statistics	3.00	0.00	3.00
CSE2111	Accounting	2.00	0.00	2.00
CSE2112	Software Development Project-I & Industrial Tour	0.00	2.00	1.00
		17.00	***10.00***	***22.00***

Second Year Second Semester

Course Code	**Course Title**	**Class hours/week**		**Credit**
		Theory	**Lab**	
CSE2201	Algorithm Design & Analysis	3.00	0.00	3.00
CSE2202	Algorithm Design & Analysis Lab	0.00	3.00	1.50
CSE2203	Computer Organization & Architecture	3.00	0.00	3.00
CSE2205	Computer Based Numerical Methods	2.00	0.00	2.00
CSE2206	Computer Based Numerical Methods Labs	0.00	1.00	0.50
CSE2207	Object Oriented Analysis and Design	3.00	0.00	3.00
CSE2208	Object Oriented Analysis and Design Lab	0.00	2.00	1.00
CSE2209	Digital System Design	2.00	0.00	2.00
CSE2210	Digital System Design Lab	0.00	1.00	0.50
CSE2211	Mathematic IV (Theory of Matrices, Fourier Analysis, Laplace Transforms)	3.00	0.00	3.00
CSE2214	Visual Programming Lab-I	0.00	2.00	1.00
CSE2216	Visual Programming Lab-II	0.00	2.00	1.00
		16.00	**11.00**	**21.50**

Third Year First Semester

Course Code	**Course Title**	**Class hours/week**		***Credit***
		Theory	**Lab**	
CSE3101	Operating System	3.00	0.00	3.00
CSE3102	Operating System Lab	0.00	2.00	1.00
CSE3103	Microprocessor & Assembly Language	3.00	0.00	3.00
CSE3104	Microprocessor & Assembly Language Lab	0.00	2.00	1.00
CSE3105	Database Management Systems	3.00	0.00	3.00
CSE3106	Database Management Systems Lab	0.00	2.00	1.00
CSE3107	Software Engineering	3.00	0.00	3.00
CSE3109	Data Communication	2.00	0.00	2.00
CSE3110	Data Communication Lab	0.00	1.00	0.50
CSE3111	Theory of Computing	2.00	0.00	2.00
CSE3116	Software Development Project-II & Industrial Tour	0.00	2.00	1.00
		16.00	**9.00**	**20.50**

Third Year Second Semester

Course Code	Course Title	Class hours/week		Credit
		Theory	Lab	
CSE3201	Compiler Design	3.00	0.00	3.00
CSE3202	Compiler Design Lab	0.00	2.00	1.00
CSE3203	Computer Network	3.00	0.00	3.00
CSE3204	Computer Network Lab	0.00	2.00	1.00
CSE3205	Computer Peripheral & Interfacing	3.00	0.00	3.00
CSE3206	Computer Peripheral & Interfacing Lab	0.00	2.00	1.00
CSE3208	Relational Database Management System Lab	0.00	2.00	1.00
CSE3209	Multimedia & Web Engineering	2.00	0.00	2.00
CSE3210	Multimedia & Web Engineering Lab	0.00	2.00	1.00
CSE3211	Communication Engineering	2.00	0.00	2.00
		13.00	**10.00**	**18.00**

Fourth Year First Semester

Course Code	Course Title	Class hours/week		Credit
		Theory	Lab	
CSE4101	Artificial Intelligence & Expert System	3.00	0.00	3.00
CSE4102	Artificial Intelligence & Expert System Lab	0.00	2.00	1.00
CSE4103	VLSI Design	3.00	0.00	3.00
CSE4104	VLSI Design Lab	0.00	2.00	1.00
CSE4105	Digital Image Processing and Computer Vision	3.00	0.00	3.00
CSE4106	Digital Image Processing and Computer Vision Lab	0.00	2.00	1.00
CSE4107	Network Routing & Switching	2.00	0.00	2.00
CSE4108	Network Routing & Switching Lab	0.00	2.00	1.00
CSE4113	IT Organization & Management	2.00	0.00	2.00
CSE4115	Optional-I	3.00	0.00	3.00
CSE4116	Optional-I Lab	0.00	2.00	1.00
CSE5000	Research Project	0.00	4.00	Continue
		16.00	**14.00**	**21.00**

Optional-I (select anyone with lab**)**

Course Code	Course Title	Class hours/week		Credit
		Theory	Lab	
CSE4115	Client Server Technology	3.00	0.00	3.00
CSE4116	Client Server Technology Lab	0.00	2.00	1.00
CSE4115	Machine Learning	3.00	0.00	3.00
CSE4116	Machine Learning Lab	0.00	2.00	1.00
CSE4115	Digital Signal Processing	3.00	0.00	3.00
CSE4116	Digital Signal Processing Lab	0.00	2.00	1.00

Fourth Year Second Semester

Course Code	Course Title	Class hours/week		Credit
		Theory	Lab	
CSE4201	Computer Graphics & Animation	3.00	0.00	3.00
CSE4202	Computer Graphics & Animation Lab	0.00	2.00	1.00
CSE4203	Neural Networks & Fuzzy System	3.00	0.00	3.00
CSE4204	Neural Networks & Fuzzy System Lab	0.00	2.00	1.00
CSE4205	Optional-II	3.00	0.00	3.00
CSE4206	Optional-II Lab	0.00	2.00	1.00
CSE4207	Optional-III	3.00	0.00	3.00
CSE5000	Research Project	0.00	6.00	5.00
		12.00	**12.00**	**20.00**

Optional-II (select any one with lab)

Course Code	Course Title	Class hours/week		Credit
		Theory	Lab	
CSE4205	Simulation and Modeling	3.00	0.00	3.00
CSE4206	Simulation and Modeling Lab	0.00	2.00	1.00
CSE4205	Basic Multimedia Theory	3.00	0.00	3.00
CSE4206	Basic Multimedia Theory Lab	0.00	2.00	1.00
CSE4205	Computational Geometry	3.00	0.00	3.00
CSE4206	Computational Geometry Lab	0.00	2.00	1.00
CSE4205	Distributed Operating System	3.00	0.00	3.00
CSE4206	Distributed Operating System Lab	0.00	2.00	1.00
CSE4205	Pattern Recognition	3.00	0.00	3.00
CSE4206	Pattern Recognition Lab	0.00	2.00	1.00
CSE4205	Embedded System Design	3.00	0.00	3.00
CSE4206	Embedded System Design Lab	0.00	2.00	1.00

Optional-III (select any one)

Course Code	Course Title	Class hours/week		Credit
		Theory	Lab	
CSE4207	Robotics	3.00	0.00	3.00
CSE4207	Large Scale Software Design Technique	3.00	0.00	3.00
CSE4207	Parallel Processing	3.00	0.00	3.00
CSE4207	Information Security and Control	3.00	0.00	3.00
CSE4207	Data Mining	3.00	0.00	3.00
CSE4207	Machine Learning	3.00	0.00	3.00
CSE4207	Bio-Informatics	3.00	0.00	3.00

Summary:

Year	*Semester*	*Credit*
1st	1st	17.5(Theory 15 + Lab2.5)
1st	2nd	19.5(Theory 17 + Lab 2.5)
2nd	1st	22(Theory 17 + Lab 5)
2nd	2nd	21.5(Theory 16 + Lab 5.5)
3rd	1st	20.5(Theory 16 + Lab 4.5)
3rd	2nd	18(Theory 13 + Lab 5)
4th	1st	21(Theory 16 + Lab 5)
4th	2nd	20(Theory 12 + Lab 8)
Total		**160(Theory 122 + Lab 38)**

First Year First Semester		
CSE1101	**Computer Basics & Programming Fundamentals**	**Credit: 3.00**
	Introduction: Number system, codes and computer logic. **Hardware:** Basic components of a digital computer, I/O unit, CPU, peripheral devices, Computer Hardware Organization, Bus organized architecture. CPU Organization, Memory devices. **Software:** Basic concepts; classification; system and application software. **Computer languages:** introducing computer languages, machine language, assembly language, High-level language, language translator-interpreter, compiler and assembler. **Networking:** Different types of Networks, network topologies, communication media. Internet: Internet service, e-mail e-commerce. **Multimedia:** Basic of audio, video& graphics. **Programming Concept**: Problem analysis, Algorithm build-up, Flowcharts and pseudo-coding. **Introduction to C:** Evolution of C, lexical design and basic syntax, token, operator, identifier, simple data types; variables ,constants, declarations; block structure, expressions and statements, compound statements, built in function, I/O functions, control statements, branching, looping , Array. **Recommended text:** 1. Introduction to computers. Author: Peter Norton, 2. Computer fundamentals. Author: P.K.Sinha 3. Computer information systems. Author: Sarah F. hatchinson 4. C programming language. Author: Kernigham & Ritchie 5. Teach Yourself C. Author: Herbert Schildt 6. Programming in Ansi C. Author: Balagurushwami 7. Turbo C/C++.The Complement Reference.Author:Herbert Schildt	

CSE1102	**Computer Basics & Programming Fundamentals Lab**	**Credit: 1.50**
	Laboratory works based on **CSE1101**	
CSE1103	**Electrical Circuit Analysis**	**Credit: 3.00**
	Fundamental electrical concepts and measuring units. Active and passive components: resistor, properties of resistors, types of resistors, Ohm's law, DC-circuits, conductance and resistance, Kirchoff's current law, current divider rule, open circuit, short circuit, etc. Analysis of series-parallel network. Methods of analysis for DC networks, current source, source conversion, branch-current analysis, mesh analysis, nodal analysis, bridge network, star delta, delta star. **Network theorems (DC):** superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Millman's theorem, substitution theorem, reciprocity theorem. Sinusoidal alternating waveforms, the sine wave, general format for the sinusoidal voltage or current. phase relations, etc. Response of basic R, L and C elements to a sinusoidal voltage or current, frequency response, rectangular and polar form, conversion between forms, phasors. **Analysis of series and parallel AC circuit:** Impedance and phasor diagram, voltage divider rule, frequency response of the R-C circuit, admittance and susceptance, current divider rule, frequency response of the parallel R-L network, etc. Analysis of series-parallel AC circuit. Methods of analysis for AC network, independent and dependent controlled source and source conversions, mesh analysis, nodal analysis, bridge network, etc. **Introduction to transformers:** Single phase and three phase transformer. **Introduction to polyphase system.** **Recommended text:** 1. Introductory Circuit Analysis. Author: R. L. Boylestad 2. Basic Electric Circuit Analysis. Author: David E. Johnson , J.L. Hilborn & J.R. Johnson 3. Alternating Current Circuits. Author: R. M. Kerchner, G. F. Corcoran 4. Electric Machines. Author: J. Nagarath and D. P. Kothari 5. Lesson's in Electrical Circuit. Author: Tony R. Kuphaldt 6. Introductory Circuitry for Electrical and Computer Engineering. Author: Nilson.	
CSE1104	**Electrical Circuit Analysis Lab**	**Credit: 1.00**
	Laboratory works based on **CSE1103**	
MATH1105	**Mathematics I**	**Credit: 3.00**
	Differential Calculus: Functions, Limit, Continuity, Differentiation of exponential and logarithmic functions, Successive differentiations, Indeterminate forms, Maxima and minima, Partial differentiations, Partial differentiations for a transformation of variables, Euler's rule on homogenous functions,Tangent, Normal, Sub-tangent and Sub-normal in Cartesian and polar coordinates. **Coordinates Geometry:** Change of axes, Pair of straight lines, General	

	equation of second degree circles, Parabola, ellipse, hyperbola and the plane. **Recommended text:** 1. Vector Analysis, Schaum's Outline Series. Author: M. R. Spiegel. 2. A text book on differential calculus. Author: Mohammad, Bhattacharjee and Latif. 3. Differential Calculus. Author: B.C. Das and B.N. Mukherjee. 4. A text book on Coordinate geometry. Author: Rahman and Bhattacharjee.	
ENG1107	**English**	**Credit: 3.00**
	English phonetics: The place and manners of articulation of the English sounds, Vocabulary, **English grammar:** construction of sentence, some grammatical problems; preposition, phrasal verbs, idioms, derivatives, Comprehension; Paragraph writing, Prices writing, Amplification, Report writing, Business communication and tenders, Short stories written by some well known classic writers. **Speaking:** How to ask questions, make requests and give instructions, How respond to queries, invitations, statements, How to introduce and thank, express gratitude, regret or appreciations, How to communicate in particular every day situations, How to express different concepts, ability, possibility, futurity, necessity, obligation, assumption, regularity, continuity, arrangement, comparison, etc. **Reading:** For skimming, For comprehension, For interpretation. **Writing:** Spelling, punctuation, indenting, brackets, abbreviation, numbers and fractions, capitalization, underlining, hyphenation, etc, Organization of writing of sentences in paragraph, and of paragraphs, in essays and letters. Practical writhing: personal and office correspondence, job application, CV. **Vocabulary:** Clues to the meaning of a word, Position in the clause, prefixes, suffixes, roots, revising and expanding vocabulary. **Listening Comprehension/ Movie show:** Introducing audio visual materials and/or movies to develop listing skills. **Recommended text:** 1. Applied English Grammar & Composition. Author: P.C. Das 2. High school English Grammar S. Chand & Company. Author: Wren & Martin 3. The Craft of Business Letter Writing. Author: Matthew M Monippally 4. The Princeton Review GRE Verbal Workout. Author: Yung-Yee Wu 5. Intermediate English Grammar. Author: Raymond Murphy 6. Communicative Grammar Practice. Author: Jones Leo	
ECO1109	**Economics & Sociology**	**Credit: 3.00**
	Introduction: Definition of economics, Economics and engineering; Principles of economics. **Micro-Economics**: Introduction to various economic systems-capitalist, command and mixed economy; Fundamental economic problems and the mechanism through which these problems are solved; Theory of demand and supply and their elasticity's; Theory of consumer behavior; Cardinal and ordinal approaches of utility analysis; Price determination; Nature of an	

	economic theory; Applicability of economic theories to the problems of developing countries; Indifference curve techniques; Theory of production, production function, types of productivity; Rational region of production of an engineering firm; Concepts of market and market structure; Cost analysis and cost function; Small scale production and large scale production; Optimization; Theory of distribution; Use of derivative in economics: maximization and minimization of economic functions, relationship among total, marginal and average concepts. **Macro-economics:** Savings; investment, employment; National income analysis; Inflation; Monetary policy; Fiscal policy and trade policy with reference to Bangladesh; Economics of development and planning. **Introduction of Sociology:** Bureaucracy as a organ of modern state, Marxism, Power authority, Pressure Group. What is Sociology? Nature and scope of Sociology, Development of Sociology. **Primary concept:** Society, Community, Association, and Institution. **Culture:** Components of culture, norms, values, folkways, mores, custom, fashion etc., Culture and Civilization types of Society: Orientate & Occidental Society. **Social Institution:** Family, Religion. **Social satisfaction and Mobility:** functionalist & Conflict perspective. **Social Change:** Theories of social change. **Social Structure:** Components of social structure. **Recommended text:** 1. Economics. Author: Samuelson 2. Modern economic theory: Author: K. K. Dewett 3. Sociology. Author: P.B. Horton, C.L. Hunt 4. Sociology. Author: R.T Schaefer 5. The Government of Modern States. Author: W.F. Willoughby

First Year Second Semester		
CSE1201	**Electronic Devices and Circuits**	**Credit: 3.00**
	Introduction: 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 (FETs):** 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 (OP-AMPs):** Linear applications of OP-AMPs, 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. **Recommended text:** 1. Electronic Devices and Circuit Theory. Author: R. L. Boylestad, L. Nashelsky 2. Integrated Electronics. Author: Millman & Halkiasa 3. Electronic Devices and Circuits. Author: Millman & Halkias 4. Basic Electronics. Author: Grob 5. Microelectronic Circuits. Author: S. Sedra, K. C. Smith 6. Principles of Electronic Circuits. Author: R. K. Mozumder	
CSE1202	**Electronic Devices and Circuits Lab**	**Credit: 1.00**
	Laboratory works based on **CSE1201**.	
CSE1203	**Structured Programming**	**Credit: 3.00**
	Introduction: Need for multifunction programs, return values, types and some examples, Calling functions and arguments, Recursions, passing arrays to functions, Storage class. **Array:** Introduction to arrays. One-dimensional array. Some sample programs, Two-dimensional array. Some sample programs, String handling in C and some examples. **Structure and Union:** Definition of Structure, Union, Structure union applications, Self-referential Structure, Linked list, Array of structure and some examples. **Pointer:** Understanding pointers, Pointers and arrays. Dynamic memory allocation, Pointers and functions, pointers and structures, Some special features of C (Macros, Enumerations), Bitwise operations. **File management:** File management concept in C, Defining, opening and closing a file, Input/output operations in file, Error handling and command line arguments, Introduction to graphics, Drawing some geometric objects. **Recommended text:** 1. C programming language. Author: Kernigham & Ritchie 2. Turbo C/C++.The Complement Reference.Author:Herbert Schildt 3. Teach Yourself C. Author: Herbert Schildt 4. Let Us C. Author: Y. Kanitkar 5. Pointers in C. Author: Y. Kanitkar 6. Programming in Ansi C. Author: Balagurushwami	
CSE1204	**Structured Programming Lab**	**Credit: 1.50**
	Laboratory works based on **CSE1203**	
CSE1205	**Discrete Mathematics**	**Credit: 3.00**
	Introduction to Discrete Mathematical Structure: Set theory, Mathematical reasoning and proof techniques, Prepositional calculus and predicate calculus. **Elementary Number Theory:** Relations, Functions, Algebraic structures,	

	Graph theory, Path and trees, Generating Functions, Permutation groups. **Discrete Probability:** Induction, contradiction and recursion, counting, Principles of inclusion & exclusion, recurrence relations, rings and groups. **Recommended text:** 1. Discrete Mathematics and its Applications. Author: Rosen, K. H 2. Discrete Mathematics. Author: Olympid Nicodemi 3. Number Theory. Author: S.G. Telang 4. Element of Discrete Mathematics. Author: C.L. Liu 5. Concrete Mathematics. Author: Knuth	
PHY1207	**Physics**	**Credit: 3.00**
	Charge, Electric field & Gauss's law: Simple phenomena in electrostatics; Electrostatics induction and charge density; Coulomb's law; Electric field & field strength; Point charge in an electric field; Dipole in an electric field; Electric flux; Gauss's law and some applications; Electric potential; Potential due to a point charge; Equipotential surfaces; Potential energy, Potential gradient; Capacitance and its calculation; Parallel plate capacitor with dielectric; Dielectric & Gauss's law; Electric vectors; Energy stored in an electric field. **Electric current, Simple circuits and Electrical Measurement:** Current and Ohm's law; E.M.F. and potential difference; Kirchhoff's laws; Whetstone bridge; Simple loop & multi loop circuits; Simple RC and LC circuits, The potentiometer; Moving coil galvanometer; Ammeter; Voltmeter; Multimeter; Wattmeter & Energy meter; Measurements of Voltage, Current, Resistance, Induction; Capacitance, Power and Energy. **Magnetic Field & Force on Current:** Coulomb's law; Magnetic field and field strength; Magnetic force on current; Ampere's law; Directions of current and field; Maxwell's cork screw rule; Fleming's left hand rule; Magnetic field near long wire; Magnetic field for solenoid; Biot-savart law. Faraday's law of electromagnetic induction; Fleming's right hand rule; Lenz's law. **Magnetic properties of matter:** Poles and dipoles; Coulomb's law for magnets and Gauss's theorem of magnetism; Dia- magnetism, Para-magnetism and Ferro- magnetism; Magnetomotive force and field intensity; Concept of self and mutual inductance; Coefficient of magnetic coupling; Rise of current and decay of current in inductive circuits; Energy of magnetic field; Inductance in series and parallel; Hysteresis and eddy current losses. **Optics:** Refraction and total internal reflection; Group velocity and Phase velocity of light; Dispersion; Interference; Holography; Fresnel and Fraunhofer diffraction; Polarization of light wave. **Recommended text:** 1. Physics part-II. Author: Robert Resnic & David Halliday 2. Field and Wave Electromagnetics. Author: D. K. Cheng 3. Fundamentals of Magnetism and Electricity. Author: D. N. Vasudeva 4. Electricity and Magnetism with Electronics. Author: K. K. Tewari 5. A Textbook of Optics. Author: N Subrahmanyam and Brij Lal	

CHEM1209	Chemistry	Credit: 2.00
	Solution: Definition, Ways of expressing concentration, Types of solution, Mechanism of dissolution, Solubility and Solubility Curve, Evolution of heat, Solutions of gases in gases: Henry's Law, Solution of gases in liquids, Solution of liquids in liquids. Distribution law, Application of distribution law. **Theory of dilute solution:** Properties of dilute solutions, Vapor pressure, Raoult's law-its application, Elevation of boiling point, Depression of freezing point and Osmotic pressure. Colloids and Properties of Colloidal System. Chemical Equilibrium: Reversible and irreversible reactions, Law of mass action, Equilibrium constants of some typical reaction, The Le-chatelier's Principle, Application of Le-chatetier's Principle. Problems involving acid-base titration. **Chemical Kinetics:** Rate of reaction, Factors affecting the reaction rate, Molecularity and Order of reaction, Rate law, First order, second order, third order, pseudo-order and zero order reaction. **Thermo-chemistry:** Enthalpy, Heat of reaction, Heat of formation, Heat of combustion and heat of neutralization, Thermo chemical laws. Electrochemistry: Electrolytes, Mechanism of electrolytic conduction, Transport number and electrolytic conductance. **Structure of atom:** The atom, Nuclear Charge and atomic number, Rutherford Atomic Model and Bohr Atomic Model, Quantum numbers, Pauli exclusion principle, Ionization energies, electron affinity, Wave nature of electrons. **Chemical Bonds:** Electronic Concept of Chemical Bonds, Types of bonds, General properties of ionic and covalent compounds, Modern approach of covalent bond. **Recommended text:** 1. Chemistry. Author: D. Lygre, W. Smith, G.T. Miller 2. Introduction to Organic Chemistry. Author: W.H. Brown 3. Buffers for pH and Metal Ion Control. Author: D.D. Perin, P. Dempsey	
MATH1211	**Mathematics II**	**Credit: 3.00**
	Integral Calculus: Definitions of Integration; Integration by the method of substitutions; Integration by parts; Standard integrals; Integration by the method of successive reduction; Definite integrals and its properties and use in summing series; Walli's formula, Improper integrals, Beta function and Gamma function; Area under a plane curve in Cartesian and polar co-ordinates, Area of the region enclosed by two curves in Cartesian and polar co-ordinates; Trapizoidal rule, Simpson's rule. Arc lengths of curves in Cartesian and polar co-ordinates; parametric and pedal equations; Intrinsic equation; Volume of solids of revolution; Volume of hollow solids of revolution by shell method. Area of surface of revolution; Jacobian, multiple integrals and their application. **Ordinary Differential Equation (ODE):** Degree and order of ordinary differential equations; Formation of differential equations; Solution of first order differential equations by various method; Solution of first order but higher degree ordinary differential equations; differential equations; Solution of general linear equations of second and higher orders with constants	

	coefficients; Solution of homogeneous linear equations and its applications; Solution of differential equations of higher order when dependent and independent variables are absent; Solution of differential equations by the method based on factorization of operators. **Partial Differential Equation (PDE):** Four rules for solving simultaneous equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$; Lagrange's method of solving PDE of order one; Integral surfaces passing through a given curve; Nonlinear PDE of order one (complete, particular, singular and general integrals): standard forms $f(p,q) = 0, z = px + qy + f(p,q), f(p,q,z) = 0, f_1(x,p) = f_2(x,p)$; Charpit's method; Second order PDE; its nomenclature and classifications to canonical (standard)- parabolic, elliptic, hyperbolic; Solution by separation of variables. Linear PDE with constant coefficients. **Series Solution:** Solution of differential equations in series by the method of Frobenius; Bessel's functions, Legendre's polynomials and their properties. **Recommended text:** 1. Calculus and the Computer. Author: S.P. Gordon 2. Differential Equations. Author: B.O. Sharma 3. Ordinary and Partial differential equations. Author: M.D. Raisingha mia 4. Integral Calculus. Author: P.K. Bhattacharjee 5. Differential Equations. Author: F. Ayres 6. Differential Equations. Author: Piaggio

Second Year First Semester		
CSE2101	**Object Oriented Programming**	**Credit: 3.00**
	Introducing C++: Definition of OOP, C++ Console I/O, Introduction to Classes, Basic concept of Object Oriented Programming, Difference between Structured Programming and Object Oriented Programming, Difference between C/C++, Introducing Function Overloading, Benefits of OOP, Characteristics of Procedure Oriented Programming, Characteristics of Object Oriented Programming and Application of Object Oriented Programming. **Introducing Classes, Arrays, Pointers and References**: Constructor and Destructor functions, Constructors with parameters, Introducing Inheritance, Object Pointers, Relation between Classes, Structures and unions, In-line functions, Automatic in-line functions, Assigning objects, Passing objects to functions, Returning objects from function, Defining member functions, Friend functions, Static member functions. Array of objects, Pointer to objects, the pointer, using new and delete, passing references, returning references independent references. **Function Overloading and Operator Overloading:** Constructor Overloading, Copy constructor, Default arguments, Overloading ambiguity, Address of overloaded function. Binary operator overloading, Unary operator	

	overloading, Relational and logical operator overloading, Operator overloading using friend functions, Limitations of operator overloading. **Inheritance**: Defining derived classes, Single inheritance, multiple inheritance, multilevel inheritance, Hierarchical inheritance, Virtual base classes, Constructors in derived classes, Nesting of classes. **C++ I/O System**: Streams, Stream classes, Unformatted I/O, Binary I/O, formatted I/O, I/O manipulators, Inserters, Extractors, File I/O streams, Opening and closing files, Random access files, I/O status checking, Customized I/O and files. **Virtual Functions**: Pointers to derived classes, Applying Polymorphism using virtual functions, Polymorphic class, Pure Virtual functions, Abstract classes, early binding, and late binding. **Template Exception Handling and Standard Template Library**: Generic functions, Generic classes, Exception handling, Throwing mechanism, Catching mechanism, Rethrowing mechanism, Specifying exceptions Templates, Components of STL, Container, Algorithms. **Recommended text:** 1. C++: The Complete Reference. Author: H. Schildt 2. C++: How to program, Author: Deitel H M and Deital P J 3. Object-Oriented programming with C++. Author: Robert Lafore 4. Teach Yourself C++. Author: Herbert Schildt 5. Turbo C++. Author: H Schildt 6. C++ Object Oriented Programming. Author: Irvine	
CSE2102	**Object Oriented Programming Lab**	**Credit: 1.50**
	Laboratory works based on **CSE2101**	
CSE2103	**Data Structure**	**Credit: 3.00**
	Introduction: Concept of data types, abstract data types. **Array:** Insertion, Deletion, Matrix representation of arrays, Multidimensional arrays, Pointers arrays, Record structures, Representation of records in memory; parallel arrays. Sparse matrices. Usefulness of sparse matrices. **Stack:** Push and Pop operations. Arithmetic expression: polish notation implementation using stack. **Queue**: Insert and Delete operations. Double ended queue, Priority queue. **Recursion:** Direct and indirect recursion, Simulation of recursion, Depth of recursion, Removal of recursion. Towers of Hanoi using recursion. **Linked lists:** One way and two way linked lists. Traversing, Searching, Insertion and Deletion operations. Concept of algorithm analysis. **Tree:** Traversing (inorder, preorder, postorder). Insertion and deletion operations in Binary search trees. Threaded Binary Tree, Application of trees. Set representation, decision trees, game trees and counting binary trees. B-tree and basic operations on B-tree. Binomial tree and binomial heap, operation on binomial heaps. Fibonacci heaps and operations. Heap sort. Huffman codes and compression algorithm. Disjoint set and operations and disjoint set forests. Red black tree and operations. General trees. **Graphs:** Graph representation, Adjacency matrix, Path matrix, Linked	

	representation. Shortest paths: Warshall 's algorithm. Operations on graphs: Insertion of an edge or a node. Deletion of an edge or a node. Traversing a graph: Breadth first, Depth first. Posets: Topological sorting. Spanning trees and connected component. Finding minimum cost spanning tree using Prim's algorithm. Critical paths, enumerating all paths. Symbol tables: Static and dynamic tree tables. **String Processing:** Basic terminology, sorting strings, character data type, string operations, word processing, pattern matching algorithms, etc. **Sorting:** Bubble sort, Quick sort Merge sort, Selection sort, Inserting sort, Radix sort, Shell sort. **Searching:** Linear searching, Binary searching. **Hashing:** Hash function and overflow handling, Open hashing (Separate chaining) Close hashing (Open addressing), Linear probing, Quadratic probing, Double hashing. **Files:** File queries sequential organization. Indexing Technique: Cylinder, surface indexing, Hash indexes trees, Indexing-Btrees, Tree indexing. **Recommended text:** 1. Data Structure. Author: Edward M. Reinggold 2. Theory and Problem of Data Structures. Author: S. Lipschutz 3. Data Structure Fundamentals. Author: Md. Rafiqul Islam, M. A. Mottalib 4. Data Structure. Author: E. Horowitz 5. Pascal plus data structure and Advance programming. Author: N. Data, S. Nilly 6. Data Structure and program design in C. Author: Kruse/Tondo/Leung (Prentice-Hall)	
CSE2104	**Data Structure Lab**	**Credit: 1.50**
	Laboratory works based on **CSE2103**	
CSE2105	**Digital Electronics**	**Credit: 3.00**
	Number System: Review of number system, Binary, Octal, Hexadecimal, BCD, ASCII. **Boolean Algebra and Minimization:** Introductory concept of number systems and codes. Boolean constants and variables, truth tables. Basic logic function. Boolean expressions. Implementing circuits from Boolean expressions. Boolean theorems, DeMorgan's theorem. Sum-of-product and product -of-Sum forms. Simplifying logic circuits, algebraic simplification, the karnaugh map method, Qnine McCkuskey design method. **Logic Gates and Combination Circuits:** Different types of logic gates. Circuit design using NAND or NOR gates only. Alternate logic-gate representations. Designing combinatorial logic circuits .Exclusive OR and NOR circuits. Logic circuits with multiple outputs. Designing without a truth table. **Flip-flops:** SR, JK, D and T flip flops. The D latch. Master slave FF. Flip flop application. FF synchronization. Data stores and transfer. Frequency division counting. One shot. **Arithmetic circuits:** Adder circuits. Carry propagation, carry look-ahead adder. IC parallel adder. The 2's complement addition and subtraction system.	

	The BCD adder. Binary multiplier. **Counters and Register:** Asynchronous Counter, Ripple counters, counters with mod numbers<2", IC asynchronous counters, asynchronous down counter, propagation delay and ripple counters. Synchronous down and up /down counters. Decoding a counter. Decoding glitches. Cascading BCD counters, Shift- register. **Counter Application:** frequency counter, digital clock. IC register. MSI Logic Circuits: Decoders, BCD-to-decimal decoders, BCD-to-7-segment decoder/drivers. Encoders. Multiplexes applications. Demultiplexer. **Integrated-Circuit Logic Families:** Digital IC terminologies, TTL series characteristics, open- collector TTL, ECL family, MOS digital ICs, MOSFET, CMOS tristate logic, TTL-CMOS-TTL interfacing. **Memory Devices:** Memory terminology, general memory operation, semiconductor memory technologies, different types of ROMs, semiconductor RAMs, static and dynamic RAMs Magnetic bubble memory, CCD memory, VHDL & FPGA Concept. **Recommended text:** 1. Digital Systems, Principles and Applications. Author: Ronald J Tocci 2. Digital Computer Electronics. Author: A P Malvino 3. Digital Electronics. Author: Taub & Schilling 4. Digital Electronics. Author: R. P. Jain	
CSE2106	**Digital Electronics Lab**	**Credit: 1.00**
	Laboratory works based on **CSE2105**	
CSE2107	**Mathematics III**	**Credit: 3.00**
	Theory of Matrices: Concepts of matrices, types of matrices, transposes, inverses, adjoints, determinants, cramer's Rule; System of linear equations, the characteristics roots and the characteristic equation of eigen values and eigen vectors of a square matrix; Caley Hamilton theorem. **Vector Analysis:** Scalars and vectors, vector addition and subtraction, scalar and vector products, scalar triple and vector triple products, Linear dependence and independence of vectors, Vector differentiation and integration, Gradient, divergence and curl of a vector, Gauss's and Stoke's theorems. **Special Functions:** Gamma and Beta functions; Bessel functions; Orthogonal functions; Legendre, Leguerre and Hermite polynomials. **Recommended text:** 1. Complex variables (S. series) 2. Complex variables. Author: M.L. Khanna 3. Special functions. Author: P.N. Chatergee.	
STAT2109	**Statistics**	**Credit: 3.00**
	Elements of Statistics: Frequency distribution. Mean median, mode and other measures of central tendency. **Measures of Dispersion:** Standard deviation and other measures of dispersion. Moments, skew ness and kurtosis. **Probability Distributions:** Elementary probability theory and discontinuous	

	probability distribution, e.g. binomial, poison and negative binomial. Continuous probability distributions, e.g. normal and exponential. Characteristics of distributions. Hypothesis testing and regression analysis. Random variables; Stochastic process; **Markov chains:** Discrete parameter, continuous parameter, birth-death process. **Queuing models:** birth-death model, Markovian model, open and closed queuing network; Application of queuing models. **Recommended text:** 1. An Introduction to Statistics and Probability. Author: M. Nurul Islam 2. Statistics. Author: Murray R. Spiegel 3. Probability and Statistics for Engineers. Author: Johnson R.A, Miller & Freud's 4. Methods of Statistics. Author: Ahmed and Bhuiya 5. Introduction to Theory of Statistics. Author: Shil and Debnath	
ACC2111	**Accounting**	**Credit: 2.00**
	Financial Accounting: Objectives and importance of accounting; Accounting as an information system; Recording system: double entry mechanism; accounts and their classification; Accounting equation; Accounting cycle: journal, ledger, trial balance; Preparation of financial statements considering adjusting and closing entries; Accounting concepts (principles) and conventions. **Financial statement analysis and interpretation:** ratio analysis. **Cost and Management Accounting:** Cost concepts and classification; Overhead cost: meaning and classification; Distribution of overhead cost; Overhead recovery method/rate; Job order costing: preparation of job cost sheet and quotation price; Inventory valuation: absorption costing and marginal/variable costing technique; Cost-Volume-Profit analysis: meaning, breakeven analysis, contribution margin approach, sensitivity analysis. **Short-term investment decisions:** relevant and differential cost analysis. Long-term investment decisions: capital budgeting, various techniques of evaluation of capital investments. **Recommended text:** 1. Principle of Accounting 8th ed. 2006. Author: J. J. Weygandt, D.E. Kieso. 2. Principle of Accounting. Author: Pyle and White 3. Principle of Accounting. Author: Pyle and Larson 4. Financial Management Theory and Practice. Author: Eugene F. Bigham	
CSE2112	**Software Development Project-I & Industrial tour**	**Credit: 1.00**
	Students will develop some Programs and a Project with proper documentation assigned by teacher.	

Second Year Second Semester		
CSE2201	**Algorithm Design & Analysis**	**Credit: 3.00**
	Introduction to Algorithm and Mathematical Induction: Introductory concepts and definitions related to algorithm formula, notation for describing algorithms, introduction to mathematical induction, examples, counting regions in the plane, simple coloring problem, simple inequality, Euler's formula, Finding edge-disjoint paths in a graph, Arithmetic versus geometric means, loop invariant etc. **Analysis of Algorithms Complexity and Design of Algorithm by Induction:** The O notation, time and space complexity, recurrence relations: intelligent guesses divide and conquer relations, recurrence relation with full history, design by induction: evaluation polynomials, maximal induced subgraph. Finding one-to-one mapping2s, the Celebrity problem, The skyline problem, computing balance factors in binary trees, finding the maximum consecutive subsequence, strengthening the induction hypothesis, dynamic programming: the Knapsack problem, etc. **Algorithm Involving Sequences and Sets:** introduction, Binary search and variations, Interpolation search, sorting: Bucket sort, Radix sort, Insertion sort, Selection sort, Merge sort, Quick sort, Heap sort, order statistics, data compression, string matching, sequence comparisons, probabilistic algorithms, finding a majority, etc. **Graph and Geometric Algorithms:** introduction, Eulerian graphs, graph traversals: Dept-first Search, Breadth-first Search, Topological Sorting, minimum-cost Spanning trees, network flows, Hamiltonian tours, decompositions of graphs, construction polynomials, convex hulls, closest pair, intersection of horizontal and vertical line segments, etc. **Reductions and NP-Completeness:** introduction, examples of reductions, reductions involving linear programming reductions for lower bounds, polynomial time reductions, nondeterminism and Cook's Theorem, examples of NP-completeness Proofs, techniques for dealing with NP-complete problems, etc. **Parallel Algorithms:** introduction, models of parallel computation, algorithms for shared-memory machines, algorithms for interconnected networks, systolic computation, etc. **Methods for the design of efficient algorithms:** divide and conquer, greedy method, dynamic programming, back tracking, branch and bound; **Recommended text:** 1. Introduction to Algorithms. Author: Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest 2. Fundamentals of Computer Algorithms. Author: Ellis Horowitz & Sartaj Sahni 3. Introduction to Algorithm: A creative Approach (Hardcover), Addison Wesley (January 1, 1989). Author: Udi Manber. 4. Introduction to the Design and Analysis of Algorithms (Paperback), Addison Wesley; 1st edition (October 30, 2002). Author: Anany V. Levitin. 5. Algorithms. Author: Robert Sedgewick 6. Introduction to Design and Analysis of Algorithms. Author:	

	Goodman	
CSE2202	**Algorithm Design & Analysis Lab**	**Credit: 1.50**
	Laboratory works based on **CSE2201**	
CSE2203	**Computer Organization & Architecture**	**Credit: 3.00**
	Computer abstraction and technology: Information representation; Measuring Performance. **Instructions and data access methods:** operations and operands of computer hardware, representing instruction, addressing styles. **Arithmetic of Computer:** Arithmetic and logical operations, floating point operations, designing ALU. Processor design: data paths –single cycle and multicycle implementations, Control Unit design- hardwired and micro programmed. **Enhancing performance with pipelining:** Pipeline: pipelined data path and control, super scalar and dynamic pipelining, Hazards, Exceptions, Buses; Multiprocessors: types of multiprocessors, performance, single bus multiprocessors, multiprocessors connected by network, clusters. **Memory organization:** cache, virtual memory, channels, DMA and Interrupts. **Recommended text:** 1. Computer Organization and Design: The Hardware/Software Interface, Third Edition. Author: D. Patterson and J. Hennessy. 2. Computer Architecture and Organization. Author: J. P. Hayes 3. Computer Organization. Author: V. C. Hamacher, Z. G. Vranesic and S. G. Zaky 4. Computer System Architecture. Author: M. M. Mano	
CSE2205	**Computer Based Numerical Methods**	**Credit: 2.00**
	Introduction: Numerical computing, Errors in Computation, stability and convergences. **Roots of Nonlinear Equations:** Bisection, false position and Newton-Raphson method. **Solution of Linear Equations:** Gaussian Elimination, Gauss-Jordan Method, Jacobi's Method, Gauss-Seidal Method. **Regression:** Linear and exponential. **Interpolation:** Lagrange and Newton polynomials. **Numerical Differentiation and Integration:** Trapezoidal and Simpson. **Numerical Solution of Ordinary Differential Equation:** Taylor series, Picard, Runge-Kutta, Euler's method. **Solution of partial Differential Equations:** Determination of characteristics equation of a matrix using Fadeev-Leverrier method; Eigen value and Eigen vector and matrix inversion. **Recommended text:** 1. Applied Numerical Method for Engineers, Thomson Books, 2002. Author: Robert J. Schilling and Sandra L Harries.	

	2. Numerical methods for Engineer. Author: Steven C. Chapra 3. Numerical Mathematical Analysis. Author: Cheny & Kinkaid 4. Numerical Method. Author: Jain & Iyenger 5. Computer Oriented Numerical Methods. Author: Rajaraman, V.	
CSE2206	**Computer Based Numerical Methods Lab**	**Credit: 0.50**
	Laboratory works based on **CSE2205** **C,C++,Java,Mathlab**	
CSE2207	**Object Oriented Analysis and Design**	**Credit: 3.00**
	Object Oriented Concepts, Analysis and Design: OO Concepts, abstraction and modeling. Software architecture, Object Oriented analysis and design and methodology. **Object modeling:** identification, classification, association, generalization and aggregation, inheritance, metadata and notation for object modeling; use case, dynamic modeling- state transition diagrams and object life cycles; State chart, class diagram, design pattern. **Object-oriented development methodologies:** object modeling technique, object oriented analysis, object oriented design; object communication models and integration of models. **Recommended text:** 1. OOAD with application. Author: Grady Booch 2. The Unified Modeling Language User Guide. Auther: Booch, Rumbaugh, Jacobson. 3. Object Oriented Modeling and Design. Author: Raumbugh 4. Unified Modeling system. Author: Raumbugh 5. Applying UML and Patterns Author: Craig Iarman 6. The Unified S/W development process. Author: Jacobson, Booch	
CSE2208	**Object Oriented Analysis and Design Lab**	**Credit: 1.00**
	Laboratory works based on **CSE2207**	
CSE2209	**Digital System Design**	**Credit: 2.00**
	Memory Devices: Design of memory subsystem using SRAM and DRAM. Design of Computer registers. **Processor Logic Design:** ALU, memory and control unit – hardwired and micro-programmed, design of Shifter & Accumulator. **Control Logic Design:** Control organization, Control of processor unit, PLA Control, Micro program Sequencer, Design using MSI and LSI components. Design using special purpose controllers. **Microcomputer system design:** Microprocessor based designs. Computer bus standards.	

	Recommended text: 1. Digital Logic and Computer Design. Author: M. M. Mano 2. Computer Engineering. Author: M. M. Mano 3. Fundamentals of Digital Systems design, 2003 PHI. Author: V.T. Rhone. 4. Digital Computer Electronics. Author: A. P. Malvino	
CSE2210	**Digital System Design Lab**	**Credit: 0.50**
	Laboratory works based on **CSE2209**	
MATH2211	**Mathematic IV**	**Credit: 3.00**
	Complex variables: Complex functions; Analytic functions; Cauchy Riemann equations; Cauchy integral theorem; Cauchy integral formula; Taylor's theorem; Laurent's theorem; Lorenz theorem; Differentiation of complex functions; poles and singularities; Residue theorem; Evaluation of definite integrals. **Fourier Analysis:** Fourier series, Fourier integrals and Fourier transforms. **Laplace Transforms:** Laplace transform of some elementary functions, some important properties of Laplace Transform (linearity property, First shifting property, Laplace Transform of derivatives, periodic functions etc.); Inverse Laplace transform, some important properties inverse Laplace transform; The convolution theorem; Application of Laplace transform to differential equations and Electrical circuits. **Recommended text:** 1. Fourier series and Boundary Value Problems. Author: Charchill 2. Laplace Transformation. Author: M. R. Spiegel 3. Linear Algebra, (S. series). Author: M. R. Spiegel 4. Mathematical Methods. Author: Md. Abdur Rahman	
CSE2214	**Visual Programming Lab-I**	**Credit: 1.00**
CSE2216	**Visual Programming Lab-II**	**Credit:1.00**

Third Year First Semester		
CSE3101	**Operating System**	**Credit: 3.00**
	Operating System: its role in computer systems; Operating system concepts; Operating system structure; **Process:** process model and implementation, Inter-Process Communication (IPC), classical IPC problems, process scheduling, multiprocessing and time-sharing; CPU management. **Memory management:** swapping, paging, segmentation, virtual memory; **Input/Output:** hardware, software, disk, terminals, clocks;	

	Deadlock: resource allocation and deadlock, deadlock detection, prevention and recovery; **File Systems:** files, directories, security, protection; Case study of some operating systems. **Recommended text:** 1. Operating System: Design and Implementation, Prentice Hall International. Author: Andrew S. Tanenvbaum. 2. Operating system Concepts. Author: J. L. Peterson & A. Silberschartz 3. Operating system. Author: Madnick & Donovan 4. Operating system Concept and Design. Author: M. milenkovic	
CSE3102	**Operating System Lab**	**Credit: 1.00**
	Laboratory works based on **CSE3101**	
CSE3103	**Microprocessors & Assembly Language**	**Credit: 3.00**
	Microprocessors: Concept of microprocessor, Evolution of microprocessors, **Internal architecture of Intel 8085,8086/8088 microprocessors:** Instruction set and format, Programming in machine assembly language, Interrupt structure, DMA, I/O operation, Microprocessor interface ICs, peripheral interfacing, Microprocessor based system design, Coprocessor, Multiprocessor system. **Intel 80286, 80386 microprocessor:** memory management scheme, Protection mechanism, 80386 modes; Pentium microprocessor; Advanced microprocessors. **Interfacing with analog word:** A/D conversion, digital ramp ADC, successive approximation ADC, flush ADC, tristate ADC, D/A converter, DAC specifications, DAC applications, Data acquisition, sample-and hold circuits, multiplexing. **Recommended text:** 1. Microprocessors and Microcomputer based system Design. Author: Md. Rafiquzzaman 2. Microprocessors and System Design. Author: Gibson & Cheu 3. Microprocessors and Interfacing: Hardware and Software. Author: D. V. Hall 4. Language Programming Technique in IBM PC. Author: Miller	
CSE3104	**Microprocessor & Assembly Language Lab**	**Credit: 1.00**
	Laboratory works based on **CSE3103**	
CSE3105	**Database Management Systems**	**Credit: 3.00**
	Introduction: Database system concepts; Purpose of database system; View of data; Data models; Conventional file processing; Transaction management; Storage management; Database administrator. **Database Model:** Entity-relationship model; Relational model, Network model; Hierarchical model, Database languages, SQL, Relational algebra, Integrity constraint, Some applications of SQL. **Database Design:** Functional dependencies and normal forms; Object-	

	oriented databases; Distributed database; multimedia database, object-relational database, Intelligent database. **File System Structure:** File organization and retrieval; File indexing; Hashing. **Database Components:** Data dictionary, security, transaction and recovery; Concurrency control. **Recommended text:** 1. Database System Concepts. Author: Henry F. Korth & Abraham Silberschatz 2. Fundamentalsn of Database Systems, Pearson Education. Author: Ramez Elmasri & S.B. Navathe. 3. Database concepts. Author: D. Kroenke and D. Auer 4. Beginning Database Design, From Novice to Professional. Author: C. Churcher.	
CSE3106	**Database Management Systems Lab**	**Credit: 1.00**
	Laboratory works based on **CSE3105**	
CSE3107	**Software Engineering**	**Credit: 3.00**
	Software Engineering Paradigms: Definition of software engineering, The classical life cycle, prototyping fourth generation technique, The product and the process, measurement matrices. **Software Project Planning:** Project planning objectives, S/W slope, Resources, Metrics for S/W productivity and quality, S/W project estimation, Decomposition techniques, Empirical Estimation Models, Automated Estimation tools, S/W project scheduling. **Requirement Analysis Fundamentals:** Analysis principle, Software Prototyping Specification, Requirement analysis Methodologies, Structured and Object oriented analysis, Data Flow-oriented Analysis methods. **Software Design fundamentals:** Design process, Design Fundamentals, S/W architecture, Program structure, Data structure, S/W procedure, Modularity, abstraction, Effective modular design, Procedural design, Data flow-oriented design, Top-down and bottom-up design, Design Process Considerations, Transform analysis, Transaction analysis, Data structure-oriented design, Logical construction of programs and systems, Data structured systems development, object-oriented design, Design concepts, methods & strategy. Real-time Design. Coding style, Code documentation, Data declaration, statement construction, Input/output. Software reliability and availability models: Software quality factors, software review, software quality metrics, Software reliability, Software quality assurance approach. **Software Testing Techniques:** Testing fundamentals, White box testing, Basis path testing, Loop testing, Black Box testing. **Software Testing Strategies:** Verification and validation, Organization for software testing, Unit testing, Integration testing, Validation testing, System testing, The art of debugging. **Software Maintenance and Configuration Management:** Definition, Maintenance Characteristics, Maintainability, Maintenance tasks, Software configuration Management.	

	Recommended text: 1. Software Engineering: Ian Sommerville. 2. Software Engineering: A Practitioners Approach. Author: R.S. Pressman 3. Software Architecture: Prospective on an Emerging Discipline. Author: Wilson 4. Fundamentals of Software Engineering. Author: Ohezzi, M. Jazayeri 5. Designing Object-oriented Software. Author: R. Wirfs-Brock et.al	
CSE3109	**Data Communication**	**Credit: 2.00**
	Introduction: Basic concept of information; Overview on data communication, Entropy; Information rate; Channel and channel capacity, Transmission modes, Transmission impairments, Guided and unguided media, Fiber optics communication, Satellite communications: frequency bands and characteristics. **Data Encoding & Multiplexing:** Sampling principal; Nyquist sampling rate; PAM, PWM, PPM, PCM, DPCM; Delta modulation; A-law & μ-law commanding; ASK, FSK, PSK & QPSK; NRZ, Bipolar AMI, Manchester, B8ZS, HDB3 coding, constellation, bit error rate(BER); Noise; Echo cancellation; Intersymbol Interference; Concepts of channel coding and capacity; Concepts of multiplexing, FDM,TDM. **Data Link Control:** Flow control; Error detection; Error control; HDLC; Other data link control protocols. **Circuit Switching & Packet Switching:** Switching network; Circuit switching network; Circuit switching concepts; Routing in CS; Control signaling; Packet switching principles; Routing in PS; X.25. **ATM and Frame Relay:** Protocol architecture; ATM logical connection; ATM cells; Transmission of ATM cells; ATM service categories; ATM adaptation layer; Frame relay. **ISDN:** Overview; ISDN channels; ISDN protocols; Broadband ISDN. **Recommended text:** 1. Data Communications and networking. Author: Behrouz A.Forouzan 2. Data and Computer Communication. Author: William Stallings 3. Communication Systems. Author: S. Haykin 4. Data Communication. Author: Hajkins 5. Data Communication. Author: Taub 6. Information, Transmission, Modulation and Noise: A Unified Approach to Communication Systems. Author: Schwartz, M	
CSE3110	**Data Communication Lab**	**Credit: 0.50**
	Laboratory works based on **CSE3109**	
CSE3111	**Theory of Computing**	**Credit: 2.00**
	Introduction: Basic concept, automata theory, computability theory, etc;	

	Mathematical notions and terminology: sets, sequences and tuples, functions and relations, graphs, strings and languages, Boolean logic, etc; Proofs: concepts of definition, theorem and proofs, finding proofs, types of proofs-proof by construction, proof by contradiction, proof by induction. **Automata and Languages:** Regular Languages, finite automata, nondeterminism, regular expressions, non-regular languages, etc; Context-free languages: context-free grammars, pushdown automata, non-context-free languages, etc. **Computability Theory:** The Church-Turing thesis, Turing machines, variants of Turing machines, the definition of algorithm- Hilbert's problems, etc.; Decidability: decidable languages, the Halting problem, etc.; undecidable problems from language theory, Post Correspondence Problem (PCP), mapping reducibility, etc.; Advanced topics in computability theory: the recursion theorem, decidability of logical theories, Turing reducibility, a definition of information, etc. **Complexity Theory:** Time complexity: measuring complexity, the class P, the class NP, NP-completeness, additional NP-complete problems, etc.; Space complexity: Savitch's theorem, the class PSPACE, PSPACE-completeness, the classes L and NL, NL-completeness, NL equals coNL, etc.; Intractability: hierarchy theorems, relativization, circuit complexity, etc.; Advanced topics in complexity theory: approximation algorithms, probabilistic algorithms, alternation, interactive proof systems, parallel computation, cryptography, etc. **Recommended text:** 1. Introduction to the Theory of Computation. Author: Michel Sipser. 2. Introduction to Automata Theory, Languages and Computation. Author: Hopcroft and Ullman 3. Introduction to Languages and The Theory of Computation. Author: John C. Martin. 4. Elements of the Theory of Computation. Author: Harry R. Lewis and Christos H. Papadimitriou. 5. An Introduction to Formal Languages and Automata. Author: Peter Linz.	
CSE3114	**Software Development Project-II & Industrial Tour**	**Credit: 1.00**
	Students will develop some Programs and a Project with proper documentation assigned by teacher.	

Third Year Second Semester		
CSE3201	**Compiler Design**	**Credit: 3.00**
	Compiler Design Principles and Techniques: Introduction; A simple syntax-directed translator; Lexical analysis; Syntax analysis; Syntax directed translation; Intermediate code generation; Run-time environments; Code generation; Machine-Independent optimizations; Instruction level parallelism; Optimizing for parallelism and locality; Interprocedural analysis, etc. **Tools for Programming, Parser Generation, Debugging and Testing in Linux:** Programming tools: the GNU compiler tool chain, building software with GNU make, building and using libraries, coverage testing with GNU gcov, profiling with GNU gprof, building packages with automake/autoconf, etc.; parser generation with flex and bison; Debugging and Testing: software unit testing frameworks, debugging with GDB, code hardening, etc. **Recommended text:** 1. Compilers: Principles, Techniques, and Tools (2nd Edition), PEARSON. Author: Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffery D. Ullman. 2. Compiler Design in C, Prentice Hall of India (PHI) private limited. Author: Allen I. Holub. 3. GNU/LINUX Application Programming, Charles River Media, Inc. Author: M. TIM. JONES. 4. Crafting a Compiler with C, the Benjamin/Cummings Publishing Company. Author: Charles N. Fischer, Richard J. LeBlanc, Jr. 5. Practice and Principles of Compiler Building with C, Prentice-Hall of India (PHI) Private limited. Author: Henk Alblas and Albert Nymeyer.	
CSE3202	**Compiler Design lab**	**Credit: 1.00**
	Laboratory works based on **CSE3201**	
CSE3203	**Computer Network**	**Credit: 3.00**
	Introduction: Introduction to Computer Networks, Network Goals, Applications of Networks, Network Structure, Network Architecture, The OSI Reference Model, Data Transmission in the OSI Terminology, Connection-Oriented and connectionless Service Primitives, Public Networks, The ARPANET, SNA. **Physical layer:** Transmission media, PSTN, Mobile telephone system, ADSL. **Data Link Layer:** Data link layer design issues, Error detection and correction, Elementary data link protocols, Sliding window protocols, HDLC, The data link layer in the internet. **Medium access sub-layer:** Multiple access protocols, ALOHA, CSMA/CD Protocol; Collision-free protocols, Wireless LAN protocols, Ethernet, Bluetooth, Data link layer switching. **Network Layer:** Network layer design issues, Routing algorithms, Congestion control algorithms, Inter networking, Network layer in the internet, Network layer in ATM networks. **Transport Layer:** The transport service, Elements of transport protocols, The internet transport protocols. **Application Layer:** DNS-domain name system, Electronic mail, The world	

	wide web, multimedia. **Network Security:** Secrecy, Authentication, Digital signature. **Recommended text:** 1. Computer Networks. Author: Tanenbaum 2. Data Communications and Computer Networks. Author: Willium Stallings 3. Data Communications and networking. Author: Behrouz A.Forouzan 4. Computer Network A System Approach. Author: Peterson and Davie	
CSE3204	**Computer Network Lab**	**Credit: 1.00**
	Laboratory works based on **CSE3203**	
CSE3205	**Computer Peripheral & Interfacing**	**Credit: 3.00**
	Input Devices: Keyboard, Key switching mechanism and coding techniques, Static encoder, Lockout and rollover, Scanning encoder, Keyboard without key. **Modern data-entry devices:** Scanners overview, Bar code reader, Optical mark reader(OMR), Optical Character Reader(OCR), Digitizer, Reading technique, Capacitive Electrostatic scanning digitizer. **Display devices:** CRT, Basic CRT operations, Timing and frequencies, CRT controllerICs, LCDs, LCD technologies, Passive and active matrix, Guest-host techniques, Twisted pneumatic LCDs, LCD reliability, Electroluminescent display. **Printers:** Impact printers, Dot matrix printers, niddle principle, Laser printing, Ink-jet printing, Color printing, Plotters. **Storage devices:** Floppy disk, Floppy disk controller, Position control with stepping actuators, Magnetic hard disk and controller, Compact disk. **Introductory Concept of interfacing:** I/O interface, memory interface, interfacing components and their characteristics. **Serial and parallel interface:** Characteristics of memory and I/O interface, Synchronous and asynchronous communication, Serial I/O interface, RS232, 8251A communication interface, RS-232 interface, 8155A Programmable peripheral Interface, parallel adapter, parallel port. **Interfacing components:** 8284A Programmable timer, Bus architecture, Bus Timing, Bus Controller, analog and digital interface, Interrupt sources, types of interrupt, 8259A priority interrupt controller, Daisy chain. **I/O Controller:** 8237A DMA Controller, Floppy and Hard disk Controller. **Recommended text:** 1. Computer Peripherals. Author: Klilkinm 2. Embedded system design. Author: P.Marwedel 3. Embedded System Design: An introduction to processes, tools and techniques. Author: Arnold Berger, Arnold S. Berger	
CSE3206	**Computer Peripheral & Interfacing Lab**	**Credit: 1.00**
	Laboratory works based on **CSE3205**	

CSE3208	**Relational Database Management System Lab**	**Credit: 1.00**
	Laboratory works based on **CSE3207**	
CSE3209	**Multimedia and Web Engineering**	**Credit: 2.00**
	Multimedia: Introduction to multimedia systems; Multimedia hardware and software; Multimedia development tools; Multimedia compression techniques and standards; Multimedia storage and retrival. **Web Engineering:** Introduction to web engineering, requirements engineering for web applications, modeling web applications, web application architectures, technology-aware web application design, technologies for web applications, testing web applications, operation and maintenance of web applications, web project management, the web application development process, usability of web applications, performance of web applications, security for web applications, the semantic web- the of meanings in the network of documents, etc. **Web Programming:** Introduction to the Internet, the web, web 2.0 and Ajax, browser basics, XHTML, cascading style sheets (CSS), JavaScript, Dynamic HTML, XML, RSS, building Ajax-enabled web application, Macromedia Flash, Adobe ® Flex ™ , Macromedia ®, Dreamweaver ®, web servers (IIS and Apache), database: SQL, MySQL, DBI and ADO.NET 2.0, web services, PHP, Ruby and Ruby on Rails, ASP>NET, web forms and web controls, JavaServer Pages web applications, Perl and CGI (Common Gateway Interface), etc. **Recommended text:** 1. Web Engineering: The Discipline of Systemetic Development of Web Applications, Wiley. Author: Gerti Kappel (Editor), Birgit Prýýll (Editor), Siegfried Reich (Editor). 2. Internet and World Wide Web How to Program, Prentice Hall. Author: Harvey M. Deitel, Paul J. Deitel and Andrew B. Goldberg. 3. Programming the World Wide Web, Addison Wesley. Author: Robert W. Sebesta. 4. Web Engineering: Principles and Techniques, Idea Group Publishing. Author: Woojong Suh (Editor).	
CSE3210	**Multimedia and Web Engineering Lab**	**Credit: 1.00**
	Laboratory works based on **CSE3209**	
CSE3211	**Communication Engineering**	**Credit: 2.00**
	Basic concepts: Synchronous and asynchronous communications, Hardware interfaces, multiplexers, concentrators and buffers. **Transmission Media:** Magnetic Media, Guided Media, unguided media, transmission impairment, performance, wavelength, media comparison, Data link control and flow control. Error detection: VRC, LRC, CRC and Checksum. **Error control codes:** linear block codes, cyclic codes, MDLC codes, convolution codes, Trellis code modulation. **The PSTN:** PSTN infrastructure, GSM Architecture, CDMA Architecture, The T-, E-, and J- Carrier Standards, Digital subscriber line(DSL), Fibre to the	

	curb(FTTC), Signaling system, SS7 architecture, Intelligent Network(IN). **Optical Communications:** Evolution of optical communication, principle of optical communication, optical sources, optical detectors, optical amplifiers, multiple channel optical system, connector, splices. **Satellite communications:** Frequency bands and characteristics, Satellite network segments, types of satellites, multiple access techniques, VSAT, Emerging Applications and innovations in satellite. Recommended text: 1. Wireless communication. Author: Rappaport. 2. Wireless & Mobile Network Architectures. Author: Yi bing Lin 3. Data communication and Networking, Author: Behrouz A. Forouzan. 4. Computer Data communication, Author: Stallings

Fourth Year First Semester		
CSE4101	**Artificial Intelligence & Expert System**	**Credit: 3.00**
	What is Artificial Intelligence: The AI problems, the underlying assumption, what is an AI technique. **The Foundations of Logic:** First Order Predicate Logic (FOPL), proposition logic. **Problems, problem spaces and Search:** defining the problem is a state space search, Production system Problem characteristics. **Searching Techniques:** Search strategies, Uniformed (blind) search strategies like BFS, Uniform cost search, DFS etc. Informed or Heuristic search strategies like Gene3erate and Test, Hill Climbing, Best First Search, Problem Reduction, constraint Satisfaction, Means-End Analysis. **Knowledge Representation Issues:** Representation and Mapping, Approaches to knowledge Representation, Issues in knowledge representation. **Using Predicate Logic:** Representing simple facts in logic, Representing Instance and Isa relationships, Computable functions and predicates, Resolution. **Representing Knowledge using Rules:** Procedural versus Declarative Knowledge, Logic Programming, Forward versus Backward Reasoning, Matching. **Game Playing:** Overview, The Minimax Search Procedure, Adding, Alpha – Beta cutoffs, Additional refinements, iterative Deepening, Planning: Overview An example Domain: The blocks Word, Components of a planning system, Goal stack planning, Understanding: What is understanding, What makes understanding hard, Understanding as constraint satisfaction. **Natural Language Processing:** Introduction, Syntactic Processing, Semantic analysis, Discourse and Pragmatic Processing. **Expert System:** Definition, characteristics and basic principles of expe systems; Architecture and description of modules; Knowledge based inferen engine; Rule-based expert systems; Formal and behavioral learning; Medic diagnostics; Financial design and Manufacturing planning; **AI Programming Language:** Prolog, LISP. **Recommended text:**	

	1. Artificial Intelligence: A Modern Approach. Author: Stuart Russell and Peter Norvig 2. Artificial Intelligence Application Programming. Author: M. Tim Jones 3. Introduction to Artificial Intelligence and Expert Systems. Author: D.W Patterson 4. Artificial Intelligence. Author: Rich, E. et al 5. Advanced Turbo PROLOG. Author: Herbert Schildt 6. PROLOG: Programming for Artificial Intelligence. Author: Ivan Bratko 7. Common LISP Language. Author: Guy L. Steele Jr. 8. LISP. Author: Patrick Henry Winston, Berthold Klaus Paul 9. Introduction to Turbo Prolog. Author: Townsend	
CSE4102	**Artificial Intelligence & Expert System Lab**	**Credit: 1.00**
	Laboratory works based on **CSE4101**	
CSE4103	**VLSI Design**	**Credit: 3.00**
	VLSI design methodology: Top-down design approach, technology trends. NMOS, CMOS inverters, pass transistor and pass gates, DC and transient characteristics. **Fabrication process:** Brief overview of NMOS, CMOS, Bi-CMOS process. NMOS and CMOS layout, stick diagram and design rules. CMOS circuit characteristics and performance estimation: resistance and capacitance, rise and fall time, power estimation. Buffer circuit design. Introduction to Bi-CMOS circuits. Complex CMOS circuits. Complex CMOS gates. CMOS building block: multiplexer, barrel shifter, adder, counter, multipliers. Data Path and memory structures. Design style: FPGA and PLDs. Introduction to HDL: basic digital design using VHDL. **Recommended text:** 1. Basic VLSI Design. Author: Douglas A. Pucknell, K. Eshraghian 2. Practical Low Power Digital Vlsi Design. Author: Gary K Yeap 3. Essentials of Electronic Testing for Digital Author: Vishwani D Agrawal 4. Analysis and Design of Digital Integrated Circuits. Author: David A Hodges	
CSE4104	**VLSI Design Lab**	**Credit: 1.00**
	Laboratory works based on **CSE4103**	
CSE4105	**Digital Image Processing and Computer Vision**	**Credit: 3.00**
	Digital Image Fundamentals: Digital Image Fundamentals, A simple Image Model, Sampling and Quantization, Basic Relationship between pixels, Image Geometry. **Image Transform:** Introduction to the Fourier Transform, The Discrete Fourier Transform, Properties of 2D Fourier Transform, The Fast Fourier Transform, Other Separable Image Transform.	

	Image Enhancement: Background, Enhancement by point Processing, Spatial Filtering, Enhancement in Frequency Domain, Color Image Processing. **Image Restoration:** Degradation Model, Diagonalization of Circulant and Block- Circulant Matrices, algebraic Approach to Restoration, Inverse Filtering, Geometric Transformation. **Morphological Image and Single Processing:** The Principle of Mathematical Morphology, Erosion and Dilation in the Euclidean Space, Closing and Opening, Grayscale Morphology, Links between Links and Sets, Grayscale Morphological Transformations. **Image Segmentation:** Detection of discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Oriented Segmentation, The use of Motion in Segmentation. **Recommended text:** 1. Digital image processing. Author: Gonzalez R.C, Woods R.E 2. Fundamentals of digital image processing. Author: Anil.K.Jain 3. Computer vision and image processing. Author: Umbaugh S.E 4. Digital image processing. William K. Pratt	
CSE4106	**Digital Image Processing and Computer Vision Lab**	**Credit 1.00**
	Laboratory works based on **CSE4105**	
CSE4107	**Network Routing & Switching**	**Credit: 2.00**
	IP addressing: IPv4 Addressing, IPv6 addressing, packet format, ICMPv6, Unicast Routing (IPv4 and IPv6): RIP, OSPF, BGP. Multicast Routing (IPv4 and IPv6): DVMRP, MOSPF, CBT, MBONE, PIM etc. **Switching/Advanced Routing:** ATM, Optical Routing, MPLS, NEMO. Routing for MANET / Ad-hoc Network: AODV, DVMRP etc. **QoS Routing:** QoS Network, Packet Scheduling, TCP/IP Queue Management. **QoS IntServ:** Admission control, Signaling Protocol(RSVP), Traffic Policing etc. **QoS DiffServ:** Policy based routing, Bandwidth Broker etc, QoS in Wireless network. **Realtime Traffic over Internet:** VoIP, RTP, RTCP, Security Issues in routing. **Recommended text:** 1. … 2. ////	
CSE4108	**Network Routing & Switching Lab**	**Credit: 1.00**
	Laboratory works based on **CSE4107**	
CSE4113	**IT Organization & Management**	**Credit:2.00**

CSE4115	**Optional-I**	**Credit:3.00**
	Students will complete one course selected from **Optional-I.**	
CSE4116	**Optional-I Lab**	**Credit:1.00**
	Laboratory works based on the selected course from **Optional-I**	
CSE5000	**Research/Project**	**Continue**
	Students will complete a research work/project with proper documentation as assigned by teacher.	

Option I (select any one with lab)		
CSE4115	**Client Server Technology**	**Credit:3.00**
	Course related updated topics.	
CSE4116	**Client Server Technology Lab**	**Credit:1.00**
	Lab work based on CSE4205.	
CSE4115	**Digital Signal Processing**	**Credit:3.00**
	Introduction to DSP, classifications of signals, continuous time and discrete time (DT) sinusoids, concept of frequency, advantages and limitations of DSP, applications of DSP, steps of ADC, sampling theorem, abasing, quantization, coding. Classification of DT signals, classification of DT systems, impulse response, FIR and IIR, block diagram of DT systems, analysis of LTI systems, convolution, properties of convolution, causality and stability of LTI systems, recursive and non-recursive systems, correlation, properties and applications of correlations. Z-transform, ROC, Inverse z-transform, properties of ztransform, concept of pole-zero, one-sided z-T. Frequency analysis, Fourier series and Fourier transforni for continuous time and discrete time signals, power density and energy density spectrums, DFT, properties of FT and DFT, invertibility of LTI systems, DFT as linear transformation, FFT, divide and conquer approach, radix-2 FFT. Structures of DT systems: Direct form, lattice structure, transposed structure. State-space system analysis. Digital filter: advantages and limitations of digital filters, adaptive filters, applications: inverse modeling, system identification, noise cancellation etc., characteristics of ideal and practical filters. Filter design: designing steps, window method, optimal method, IIR filter design methods. **Recommended text:** 1. Digital Signal Processing- A Practical Apporach. Author: Immanuel C.Ifrehor, Barrier W. Jervis. 2. Introduction to Digital signal processing. Tatsuo Higuchi, Shoukoudou. 3. Digital Signal Processing. Author: A. V. Oppenheim & R. W. Schafe 4. Digital Time Signal Processing. Author: A.V. Oppenheim & R. W. Schafe 5. Digital Signal Processing in Communication Systems. Author: Marvin	

	E Frerking 6. Detection Theory: Applications and Digital. Author: Ralph D Hippenstiel	
CSE4116	**Digital Signal Processing Lab**	**Credit:1.00**
	Lab works based on **CSE4115**.	
CSE4115	**Machine Learning**	**Credit:3.00**
	Introduction: Basic concepts, **Supervised Learning:** Supervised learning setup, LMS, Logistic regression, Perceptron, Exponential family, Generative learning algorithms, Gaussian discriminant analysis, Naïve Bayes, Support vector Machines, Model selection and feature selection. **Ensemble Methods:** Bagging, boosting, ECOC, Evaluating and debugging learning algorithms. **Learning theory:** Bias/variance tradeoff, Union and Chernoff/Hoeffding bounds, VC dimension, Online learning, Practical advice on how to use learning algorithms. **Unsupervised learning:** Clustering, K-means, EM, Mixture of Gaussians, Factor analysis, PCA, MDS, nPCA, Independent components analysis (ICA). **Reinforcement learning and control:** MDPs. Bellman equations, Value iteration and policy iteration, Linear quadratic regulation(LQR), LQG, Q learning, Value function approximation, Policy search, Reinforce, POMDPs. **Recommended Text:** 1.Pattern Recognition and Machine Learning: Author Christopher M. Bishop 2.Information theory, Inference, and Learning Algorithms: Author David J.C. MacKay.	
CSE4116	**Machine Learning Lab**	**Credit:3.00**
	Lab works based on **CSE4115**.	

Fourth Year Second Semester		
CSE4201	**Computer Graphics & Animation**	**Credit:3.00**
	Graphics hardware: display devices, input devices etc; **Basics:** Basic raster graphics algorithm for drawing 2D primitives; Two-dimensional and three-dimensional viewing, clipping and transformations; **Three-dimensional object representations:** polygon surface, B-Spline curves and surfaces, BSP trees, Octrees, Fractal-Geometry methods; **Visible surface detection methods:** Z-buffer method, BSP tree method, **Ray casting method:** Illumination models; **Surface rendering methods:** polygon rendering, ray tracing, terrain visualization with height mapping, modeling surface with texture mapping; Color models; **Graphics Animation:** Real-time graphics, Graphic display & updates, Keyframing systems, Motion specification. **Computer Animation:** Overview of design animation sequences, basic rules of animation, problems in animation, techniques of animation, morphing, etc.	

	Recommended text: 1. Outline of Computer Graphics (2nd Edition).Author: Zhigang Xian, Roy A. Plastock, Schaum's. 2. Interactive Computer Graphics: A top-down Approach Using OpenGL (4th Ed.) Author: Angel. 3. Computer Graphics Using OpenGL (3rd Ed.) Author: Francis S.Hill Jr., Stephen M. Kelley. 4. OpenGL: A Primer (2nd Ed.). Author: Angel. 5. Computer Graphics Principles and Practice in C (2nd Ed.) . Author: James D. Foley, Andries van Dam, Steven K. Feiner, John F. Huges. 6. The Computer Animator's Technical Handbook. Author: Lynn Pocock. Judson Rosebush, Morgan-Kaufmann.	
CSE4202	**Computer Graphics & Animation Lab**	**Credit:1.00**
	Laboratory works based on **CSE4201**	
CSE4203	**Neural Networks & Fuzzy System**	**Credit:3.00**
	Introduction: Biological Neural network and artificial neural network, modeling and learning a single neuron, network properties, types, layers, connections; **Neural network models:** Single layer perceptrons and multi layer perceptrons, Backpropagation algorithm and network, Nearest Neighbour network, Hopfield network, Biodrectional Associative Memory(BAM), Adaptive Resonance Theory(ART) network, Kohonen network, Boltzman machine. **Neural network learning:** definition of learning, Supervised and Unsupervised learning; Hebbian learning, Competitive learning, Error correction learning. **Fuzzy System:** Fuzziness vs. probability, fuzzy associative memory, FUZZY Associative Memory(FAM),comparison of fuzzy and neural truck backer-upper control systems, adaptive FAMs, fuzzy image transform coding. Comparison of fuzzy and kalman filter, Fuzzy and Neural control systems, Genetic algorithm. **Recommended text:** 1. Neural Networks—a Comprehensive Foundation. Simon Haykin. 2. Neural Networks and Fuzzy Systems. Author: Bart kosko. 3. Neural Networks in Computer Intelligence. Author: LiMin Fu. 4. Neural Computing. Author: Beale, Jackson 5. Neural Networks, Fuzzy logic and Genetic Algorithms. Author: S.Rajasekaran, G.A Vijayalakshmi pai	
CSE4204	**Neural Networks & Fuzzy System Lab**	**Credit:1.00**
	Laboratory works based on **CSE4203**	
CSE4205	**Optional-II**	**Credit:3.00**
	Students will complete one course selected from **Optional-II**	

CSE4206	**Optional II-Lab**	**Credit:1.00**
	Laboratory works based on the selected course from **Optional-II**	
CSE4207	**Optional-III**	**Credit:3.00**
	Students will complete one course selected from **Optional-III**	
CSE5000	**Research/Project**	**Credit:3.00**
	Students will continue the research work, which will be assigned by teacher in 4^{th} year 1^{st} semester.	

Option II (select any one with lab)		
CSE4205	**Simulation and Modeling**	**Credit:3.00**
	Simulation modeling basics: Systems, models and simulation; Classification of simulation models; Steps in a simulation study; Concepts in discrete-event **simulation:** Event-scheduling vs. process-interaction approaches, time-advance mechanism, organization of a discrete-event simulation model; Continuous simulation models; Combined discrete-continuous models; Monte Carlo simulation; Simulation of queuing systems. **Building valid and credible simulation models:** Validation principles and techniques, statistical procedures for comparing real-world observations and simulation outputs, input modeling; Generating random numbers and random variates; Output analysis. **Application of Simulation:** Simulation languages; Analysis and modeling of some practical systems. Concepts covered in lecture applied in computer laboratory assignments. **Recommended text:** 1. Simulation Modeling and Analysis. Author: Law Kelton. 2. Elements of Simulation. Author: Byron J. T. Morgan 3. Simulation Modeling and Analysis. Author: Law, Keltan 4. System Simulation. Author: D.S.Hira 5. System Simulation. Author: Geoferry Goedon	
CSE4206	**Simulation and Modeling Lab**	**Credit:1.00**
	Laboratory works based on CSE4205	
CSE4205	**Basic Multimedia Theory**	**Credit:3.00**
	Multimedia system- introduction; Coding and compression standards; Architecture issues in multimedia; Operating system issues in multimedia-	

	real –time OS issues, synchronization, interrupt handling; Database issues in multimedia- indexing and storing multimedia data, disk placement, disk scheduling, searching for a multimedia document; Networking issues in multimedia – Quality- of-service guarantees, resource reservation, traffic specification, haping, and monitoring , admission control; Multicasting issues; Session directories; Protocols for controlling sessions; Security issues in multimedia- digital watermarking, partial encryption schemes for video on demand, voice over IP.	
CSE4206	**Basic Multimedia Theory Lab**	Credit:1.00
	Laboratory works based on CSE438	
CSE4205	**Computational Geometry**	**Credit:3.00**
	Introduction: Historical perspective, algorithmic background, geometric preliminaries, models of Computation. Geometric searching, point location problem and range searching problems, Divide & conquer, amortization, multi- dimensional search, space sweep, duality and randomization. Convex hulls. Proximity, Closest pair problems, Intersections, Voronoi diagram and Delaunay triangulation, arrangements of lines and points, Geometry of rectangles, hidden surface removal, polygon triangulation, art gallery theorems, shortest paths, and lower bounds. **Recommended text:** 1. Computational Geometry. Author: Shamos 2. Computational Geometry & Computer Graphics in C++. Author: Michael J. Laszlo 3. The Art of Computer Programming, Vol 2. Seminumerical Algorithms. Author: Knuth	
CSE4206	**Computational Geometry Lab**	**Credit:1.00**
	Laboratory works based on CSE4205	
CSE4205	**Distributed Operating System**	**Credit:3.00**
	Introduction to Distributed Systems Communication in Distributed Systems. Synchronization in Districted Systems. Clock Synchronization, Mutual Exclusion, Election Algorithm, Atomic Transactions. Deadlocks in Distributed systems. Processes and processor in Distributed Systems: Threads, Systems Models, Processors Allocation, and Scheduling in Distributed Systems. Fault tolerance, Real-Time Distributed Systems. Distributed File Systems: Distributed File System Design, Distributed File System Implementation. Trends in Distributed File Systems. Distributed Shared Memory: Consistency Model, Page-Based Distributed Shared Memory, Shared-Variable Distributed Shared Memory, Object-Based Distributed Shared Memory, Comparison.	

	Recommended text: 1. Distributed Operating System. Author: Andrew S. Tanenbaum. 2. Distributed operating System. P.K.Sinha	
CSE4206	**Distributed Operating System Lab**	**Credit:1.00**
	Laboratory works based on **CSE4205**	
CSE4205	**Pattern Recognition**	**Credit:3.00**
	Introduction to pattern recognition: Classification Statistical Methods, Structural Methods and Hybrid method. Introduction to passen grammar and languages. Applications to character recognition medical imaging area. feature detection, classification, Review of probability and some linear algebra. Bayesian Decision making, linear discriminants, reparability, multi-class discrimination; quadratic classifiers, Fisher discriminant, sufficient statistics, coping with missing or noisy features, Bayesian estimation; non-parametric estimation; Non-parametric classification, density estimation, Parzen estimation,training methods, maximum likelihood, Bayesian parameter estimation, MAP. Linear discriminant functions.. Template-based recognition, eigenvector analysis, feature extraction, Eigen vector analysis. Clustering, unsupervised learning, vector quantization, K-means and E/M, neural nets. Sequence analysis, HMMs. k-nearest-neighbor classification, Mixture modeling, Optimization by ExpectationMaximization, Hidden Markov models, Viterbi algorithm, Baum-Welch algorithm, Linear dynamical systems, Kalman filtering and smoothing, Bayesian networks, independence diagrams, Decision trees, Multi-layer Perceptrons. **Recommended text:** 1. Pattern Recognition Principles. Author: Gonzaleg 2. Pattern Recognition: Statistical structural and neural approaches. Author: Robert J. schalkoff, John Wiley & Sons, Inc. Latest edition.	
CSE4206	**Pattern Recognition Lab**	**Credit:1.00**
	Laboratory works based on CSE4205	

CSE4205	**Embedded System Design**	**Credit:3.00**
	Concepts, classification; Characteristics; Requirements; Introduction to embedded system design process, Unified Modeling language (UML); Embedded microcontroller cores; Embedded memories; Technological aspects; Interfacing between analog and digital blocks; Signal conditioning digital signal processing, sub-system interfacing; interfacing with external systems, user interfacing; Design trade-offs, thermal considerations; Networked embedded systems; the 12C bus, the CAN bus, the FlexRay; Example of applications. **Recommended text:** 1. Embedded Systems Design – Arnold S. Berger. 2. Embedded Systems: World Class Design- Jack G Ganssle. 3. Embedded System Design-Frank Vahid and Tony Givergis.	
CSE4206	**Embedded System Design Lab**	**Credit:1.00**
	Laboratory works based on CSE4209	

Option III (select any one)		
CSE4207	**Robotics**	**Credit:3.00**
	Robotic manipulation, direct kinematics; the Arm Equation, Inverse Kinematics: Solving the arm equation, work space analysis and trajectory planning, differential motion and static, manipulator dynamics, robot control, task planning. Relationship between image and structure, image representation, segmentation pattern, perspective transformation, camera calibration, shape analysis, object recognition and picture languages. **Recommended text:** 1. Fundamentals of Robotics: Analysis and Control. Author: Robert J Schillin 2. Robot Building for Beginners. Author: David Cook 3. Introduction to Robotics: Mechanics and Control. Author: John J. Craig 4. Robot Programming: A Practical Guide to Behavior-Based Robotics. Author: Joe Jones	
CSE4207	Large Scale Software Design Technique	Credit:3.00
	Course related updated topics.	

CSE4207	**Parallel Processing**	**Credit:3.00**
	Parallel Computing architectures: Overview of the major classes of architectures and their evolution. Parallel programming models and performance analysis: Modeling, Performance analysis, efficiency, and benchmarking. Programming parallel computers: Overview of parallel programming, parallel languages, parallel zing compilers, message passing and data parallel Programming models. Message passing programming and MPI: Uses, historical background and use on MIMD machines; current implementations; programming using the Message Passing Interface (MPI). Data parallel programming and HPF: Data parallel programming paradigm; historical background and use of SIMD machines; array syntax; Fortran 90 and High Performance FORTRAN (HPF). Shared memory programming, threads and Open MP: Use of shared memory machines; threads; mutual exclusion; locks, semaphores and monitors; parallel Java; programming using Open MP. Case Study: Monte Carlo Simulation of the Ising Model- Case study from computational physics; different approaches to parallelism; regular vs irregular problems; techniques and tricks for parallel implementation in MPI, HPF, Open MP and threads. Distributed computing: Distributed and concurrent computing on loosely coupled distributed systems; motivation and applications; transparency and met computing; networks and clusters of workstations; cluster systems. Distributed computing middleware: Middleware, RPC; DCE; CORBA; Java RMI Middleware, DCE CORBA Java RMI. Grid computing: The Grid; Grid computing (met computing over wide-area networks): grid computing environments (Globes Legion, DISC World...); Internet computing (SETI@Home, etc.) Grid computing: Internet computing. **Recommended text:** 1. Distributed and Parallel Computing. Author: Crichlow, J. M. 2. Semantic Cognition: A Parallel Distributed. Author: Timothy T Rogers 3. A Parallel Distributed Processing. Author: Minyi Guo 4. Parallel Processing. Author: Raman 5. Parallel Processing. Author: M. J. Quin	
CSE4207	**Information Security and Control**	**Credit:3.00**
	Introduction; Cryptology and simple cryptosystems; Conventional encryption techniques; Stream and block ciphers; DES; More on Block Ciphers; The Advanced Encryption Standard; Confidentiality & Message authentication: Hash functions; Number theory and algorithm complexity; Public key Encryption; RSA and Discrete Logarithms; Public key encryption (continued): Elliptic curves; Digital signatures; Key management schemes; Identification schemes; Dial-up security; E-mail security, PGP, S-MIME; Kerberos and directory authentication; Emerging Internet security standards; SET; SSL and IPsec; VPNs; Firewalls; Viruses; Miscellaneous topics; **Recommended text:** 1. Security in Computing. Author: Charles P. Pfleeger and Shari Lawrence Pfleeger	

	2. Cryptography and Network Security. William Stallings.	
CSE4207	**Data Mining**	**Credit:3.00**
	Data Mining: Definitions, KDD(Knowledge Discovery Database) versus Data Mining, DBMS versus Data Mining, Data Mining Techniques, Issues and Challenges, Applications of Data Warehouse & Data mining in Government. **Association Rules:** A priori algorithm, partition algorithm, Dynamic insert counting algorithm, FP- tree growth algorithm, Generalized association rule. **Clustering Techniques:** Clustering paradigm, CLARA, CLARANS, Hierarchical clustering, DBSCAN, BIRCH, CURE, Categorical clustering, STIRR, ROCK, CACTUS. **Classification Techniques:** Bayesian rule, KNN algorithm. **Decision Trees:** Tree construction principle, Best split, Splitting indices, Splitting criteria, Decision tree construction with presorting. **Web Mining:** Web content Mining, Web structure Mining, web usage Mining, Text Mining. **Temporal and Spatial Data Mining:** Basic concepts of temporal data Mining, The GSP algorithm, SPADE, SPIRIT, WUM. **Recommended text:** 1. Data Mining Introductory and Advanced Topics. Author: Margaret H. Dunhan. 2. Data Mining Techniques. Author A.K.Pujari, Universities Press. 3. Data Mining: Concepts and techniques. Author: Han & Kamber. 4. Data Warehousing, Data Mining and OLAP, Alex Berson and Stephen J Smith, TMH.	
CSE4207	**Bio-informatics**	**Credit:3.00**
	Review of DNA, Transcription, Translation, Protein Structures, Amino Acids, etc. General Introduction to Genomics and Proteomics Methods. BLAST, Advanced BLAST, Psi-BLAST, Phi-BLAST. Motif searches. Prosite, Profilescan. How to submit a sequence to Genbank (BankIt, SeqIn). Navigating the NCBI web site. Genbank, EMBL, OMIM, PubMed. Introduction to the VectorNTI Suite of software. Navigating other genome database sites (Ensembl, Celera). Refseq, LocusLink, Unigene. 2-D Gel Electrophoresis. Gene expression, genetic engineering, applications to transgenic plants and animals. Knockout genes. Introduction to a comprehensive sequence analysis suite (Lasergene). Protein structure analysis: alpha and beta structure, hydropathy, membrane topology, antigenicity, post-translational modifications, targeting signals. **Recommended text:** 1.Fundamental concepts of Bioinformatics. D.E. krane and M.L. Raymer, Benjamin Cummings 2.An introduction to bioinformatics algorithms. Author: Neil C. Jones, Pavel A. Pevzner 3.Bioinformatics for dummies. Author: Jean-Michel Claverie 4.Bioinformatics: Sequence and Genome analysis. Author: David W. Mount	