### APPROVED CURRICULUM

### (To be effective from Spring semester, 2014)

**DEPARTMENT OF**

**COMPUTER SCIENCEE&ENGINEERING (CSE)**

**UNDERGRADUATE PROGRAM**

Bachelor of Science (Honors) in Computer Science & Engineering (B.Sc. (Honors) in CSE)

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### LEADING UNIVERSITY

### S Y L H E T

**Surma Tower, VIP Road, Bondorbazar, Sylhet**

**Tel: (0821) 720303, Fax: 88-0821-720307**

**Course Description of CSE Program**

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| **ENG-1111** | **English Reading and Speaking** |
|  | The course aims at building the ability of the students in correct reading fiction texts, non-fiction texts, speaking with a good pronunciation and the course is designed so that students will have a good idea about making requests, giving commands, inviting people, giving advice, suggestions, asking questions, making comments and presentation building. |
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| **ENG-1311** | **English Writing and Listening** |
|  | The course aims at building the ability of the students in correct writing, composition and presentation of English. The emphasis of the course is on correct and independent writing and correct listening to individual phoneme and word pronunciation, listening to monologue, listening to dialogue and conversation. |
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| ART-1111 | Bangladesh Studies |
|  | Bangladesh: History Society, Culture, Geo-politics & Economics.Pakistan: East West Relationship, Development of internal colonialism, The constitution of 1956, 1962, Centre-province relationship, Martial Law Regimes, Nation Building, State Building, Basic Democracy and its impact in Politics.Movement: Language Movement of 1952, Constitutional movement of 1962, War 1965, Six point Formula and Movement of 1966, Mass Movement of 1968-69 (Non cooperation movement and struggle for constitutional autonomy), Election of 1970.Emergence of Bangladesh: Army crackdown and genocide, liberation war: causes and various dimensions.Political Process of Bangladesh: Democratic Practice and constitutional experimentations in Bangladesh, Military Rule, Civilization Process, power and functions of the organs of government (executive, legislature and judiciary).Administration of Bangladesh: Bureaucracy and its characteristics and functions, structure and organization of Bangladesh secretariat and attached departments, planning commission and Bangladesh public service, local government. Independence movement, Constitutional land mark, Emergence of Bangladesh, Political economy of Bangladesh, Bangladesh agriculture, Unemployment in Bangladesh, Bangladesh industry, Economic planning, Social security in Bangladesh. |
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| ACC-2111 | Principles of Accounting |
|  | Introduction: Financial Accounting-definition and Scope, objectives of Financial Accounting, Keeping Terms used in accounting, users of accounting information and limitations of Financial Accounting. Conceptual Framework: Accounting Concepts, Principles and Conventions, Accounting Policies, Accounting as a measurement discipline, valuation Principles, accounting estimates. Recording of transactions: Voucher system; Accounting Process, Journals, Subsidiary Books, Ledger, Cash Book, Bank Reconciliation Statement, Trial Balance. Depreciation: Meaning, need & importance of depreciation, methods of charging depreciation. Preparation of final accounts: Preparation of Trading and Profit & Loss Account and Balance Sheet of sole proprietary business. Computerized Accounting: Computers and Financial application, Accounting Software packages. An overview of computerized accounting system - Salient features and significance, Concept of grouping of accounts, Codification of accounts, maintaining the hierarchy of ledger, Generating Accounting Reports. |
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| **ART-1215** | **Public Administration** |
|  | Public Personnel Administration: Meaning Scope and Importance of Personnel Administration, Approaches & Challenges, Historical Development of Personnel Administration. Pioneers of Personnel Administration: Fredrick w. Taylor, Henry Fayol and George Elton Mayo. Human Resource Planning Definition, Elements, Importance, Human Resource Planning Process, Approaches. Personnel Agency: Types, functions and Importance. Procurement: Recruitment, selection and placement Transfer, Promotion. Development: Training, Importance, Employee training process, types and methods of training, career management. Appraisal: job analysis, job evolution, performance appraisal, objective and methods of performance appraisal, MBO. Compensation: wage and salary, compensation plan. Integration: Motivation: Definition, importance, theories of motivation. Maintenance: grievances procedure, disciplinary action. Separation: retirement employee benefit. Industrial relation & communication: industrial relation, industrial disputes, means of settlement of industrial disputes, trade union, collective bargaining. Public personnel research.  |
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| ART-1217 | Political Science |
|  | Making of Bangladeshi Constitution. Constituent Assembly: Composition and Working. Preamble and Salient Features of Indian Constitution. Fundamental Rights and Fundamental Duties, Directive Principles of State Policy. President and Prime Minister. Parliament. Supreme Court, Judicial Review and Judicial Activism. Governor, Chief Minister and State Legislatures. Panchayati Raj and Municipal Governments. Nature of Federal System and Centre-State Relations. Election Commission and Electoral Reforms, National Commission for Scheduled Castes, National Commission for Scheduled Tribes. |
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| ART-1311 | **Introduction to Sociology** |
|  | The Sociological Perspective, Development of Sociology, Sociological Research, Culture and Society, Socialization, Social Structure, Social Institutions: The Family, Social Stratification, Social Inequality, Social Institutions: Government, Economy, and the Environment. |
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| ART-2213 | Professional Ethics |
|  | Human values: morals, values and ethics, integrity, work ethic, service learning, civic virtue, respect for others, living peacefully, character, spirituality. Engineering ethics: senses of ‘engineering ethics’, variety of moral issue, types of inquiry, moral dilemmas, moral autonomy, Kohlberg’s theory, Gilligan’s theory, consensus and controversy, models of professional roles, theories about right action, self-interest, customs and religion, uses of ethical theories. Engineering as social experimentation: engineering as experimentation, engineers as responsible experimenters, codes of ethics, a balanced outlook on law, the challenger case study. Safety, responsibilities and rights: safety and risk, assessment of safety and risk, risk benefit analysis and reducing risk, the three-mile-island and Chernobyl case studies. Collegiality and loyalty, respect for authority, collective bargaining, confidentiality, conflicts of interest, occupational crime, professional rights, employee rights, intellectual property rights, discrimination. Global issues: multinational corporations, environmental ethics, computer ethics, weapons development, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership, sample code of ethics like asme, asce, ieee.  |
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| ECO-2211 | **Principles of Economics** |
|  | Introduction: Definition of economics, scope and utility of studying economics. Microeconomics: The theory of demand and supply and their elasticity, price determination, nature of an economic theory, applicability of economic theories to the problems of developing countries. Indifference curves technique, Marginal utility analysis. Production: Production function, types of productivity, the nature of Isoquants and Isocosts, rational region of production of an engineering firm, Euler’s theorem. Market: Concepts of market and market structure, cost analysis and cost function, small-scale production and large-scale production, optimization, theory of distribution. Macroeconomics: Savings, investment, employment, national income analysis, inflation, monetary policy, fiscal policy and trade policy with reference to Bangladesh. Economics of development: Dimensions of development, relevance of theory, the employment problem, human resource development. Economics of planning: Planning and market, policy models, planning experience. |
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| **MGT-2315** | **Introduction to Business** |
|  | The course outlines the philosophy, objectives, activities and responsibility of business enterprises and familiarizes with business enterprises, business terminology and business environment. Included in the course are forms and procedure of business organization, procedure for business startup, sources of finance, agencies involved in business startup, major business decisions, associations in business world, major business functions and careers in business. Functional areas of business such as marketing, production, finance, accounting, personnel, etc. are discussed, includes a project work on how to set up a business. |
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| **MGT-3111** | **Industrial Management** |
|  | UNIT I: Concepts of Management and Organisation – Functions of Management – Evolution of Management Thought : Taylor’s Scientific Management, Fayol’s Principles of Management, Douglas Mc-Gregor’s Theory X and Theory Y, Mayo’s Hawthorne Experiments, Hertzberg’s Two Factor Theory of Motivation, Maslow’sHierarchy of Human Needs – Systems Approach to Management.UNIT II: Designing Organisational Structures : Basic concepts related to Organisation - Departmentation andDecentralisation, Types of mechanistic and organic structures of organisation (Line organization, Line andstaff organization, functional organization, Committee organization, matrix organization, Virtual Organisation,Cellular Organisation, team structure, boundaryless organization, inverted pyramid structure, lean and flatorganization structure) and their merits, demerits and suitability.UNIT III: Plant location, definition, factors affecting the plant location, comparison of rural and urban sites-methods forselection of plant- Matrix approach. Plant Layout – definition, objectives, types of production, types of plantlayout – various data analyzing forms-travel chart.UNIT IV: Work study - Definition, objectives, method study - definition, objectives, steps involved- various types ofassociated charts-difference between micromotion and memomotion studies. Work measurement- definition,time study, steps involved-equipment, different methods of performance rating- allowances, standard timecalculation. Work Sampling – definition, steps involved, standard time calculations, differences with timestudy.UNIT V: Materials Management-Objectives, Inventory – functions, types, associated costs, inventory classificationtechniques-ABC and VED analysis. Inventory Control Systems-Continuous review system-periodical reviewsystem. Stores Management and Stores Records. Purchase management, duties of purchase of manager,associated forms.UNIT VI: Introduction to PERT / CPM : Project management, network modeling-probabilistic model, various types ofactivity times estimation-programme evaluation review techniques- Critical Path-probability of completing theproject, deterministic model, critical path method (CPM)-critical path calculation-crashing of simple ofnetworks.UNIT VII: Inspection and quality control, types of inspections - Statistical Quality Control-techniques-variables andattributes-assignable and non-assignable causes- variable control charts, and R charts, attributes controlcharts, p charts and c charts. Acceptance sampling plan- single sampling and double sampling plans-OCcurves. Introduction to TQM-Quality Circles, ISO 9000 series procedures.UNIT VIII: Introduction to Human Resource Management, Functions of HRM, Job Evaluation, different types ofevaluation methods. Job description, Merit Rating.- difference with job evaluation, different methods of meritratings, wage incentives, different types of wage incentive schemes. Marketing, marketing vs selling,marketing mix, product life cycle.TEXT BOOKS:1. Amrine, Manufacturing Organization and Management, Pearson, 2nd Edition, 2004.2. Industrial Engineering and Management O.P. Khanna DhanpatRai. |
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| **PHY-2211** | **General Physics** |
|  | Heat and Thermodynamics: Principle of temperature measurements: platinum resistance thermometer, thermo-electric thermometer, pyrometer; Kinetic theory of gases: Maxwell’s distribution of molecular speeds, mean free path, equipartition of energy, Brownian motion, Van der Waal’s equation of state, review of the 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, Gibbs Phase Rule, Third Law of thermodynamics. Structure of Matter: Crystalline and non-crystalline solids, single crystal and polycrystal solids, unit cell, crystal systems, co-ordinations number, crystal planes and directions, sodium chloride and CsCl structure, packing factor, Miller indices, relation between interplanar spacing and Miller indices, Bragg’s Law, methods of determination of interplanar spacing from diffraction patterns; Defects in solids: point defects, line defects; Bonds in solids, inter-atomic distances, calculation of cohesive and bonding energy; Introduction to band theory: distinction between metal, semiconductor and insulator. Waves and Oscillations: Differential equation of a simple harmonic oscillator, total energy and average energy, combination of simple harmonic oscillations, Lissajous’ figures, spring-mass system, calculation of time period of torsional pendulum, damped oscillation, determination of damping co-efficient, forced oscillation, resonance, two body oscillations, Reduced mass, differential equation of a progressive wave, power and intensity of wave motion, stationary wave, group velocity and phase velocity, architectural acoustics, reverberation and Sabine’s formula. Physical Optics: Theories of light; Interference of light, Young’s double slit experiment; Displacements of fringes and its uses; Fresnel Bi-prism, interference at wedge shaped films, Newton’s rings, interferometers; Diffraction of light: Fresnel and Fraunhoffer diffraction, diffraction by single slit, diffraction from a circular aperture, resolving power of optical instruments, diffraction at double slit & N-slits-diffraction grating; Polarization: production and analysis of polarized light, Brewster’s law, Malus law, Polarization by double refraction, retardation plates, Nicol prism, optical activity, polarimeters, polaroid. |
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| PHY-2212 | General Physics Sessional |
|  | LIST OF EXPERIMENTS 1. Experiment with spring:a. To verify Hooke’s law for a spring. b. To determine the modulus of rigidity of the material of the spring. c. To observe the harmonic motion of the spring for different loads attached to it. 2. To determine the acceleration due to gravity ‘g’ by means of a compound pendulum. 3. To determine the surface tension of water by capillary rise method. 4. To determine rigidity modulus of the material of a wire by dynamic method. 5. To determine the coefficient of viscosity of water at room temperature. 6. To determine Young’s modulus of the material of a wire by Searle’s apparatus.7. To verify Ohm’s law by using a tangent galvanometer. 8. To determine the resistance of a Voltmeter. 9. To determine the horizontal component of the earth’s magnetic field and the magnetic moment of a bar magnet by magnetometer. 10. To determine the end-corrections of a meter bridge and hence to determine the specific resistance of wire.  |
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| **CHE-2311** | **Chemistry** |
|  | Atomic structure, quantum numbers, electronic configuration, periodic table; Properties and uses of noble gases; Different types of chemical bonds and their properties; Molecular structure of compounds; Selective organic reactions; Different types of solutions and their compositions; Phase rule, phase diagram of monocomponent system; Properties of dilute solutions; Thermo-chemistry, chemical kinetics, chemical equilibria; Ionization of water and pH concept; Electrical properties of Solution. |
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| **CHE-2312** | **Chemistry Sessional** |
|  | Volumetric analysis: acid-base titration, oxidation-reduction titration, determination of Fe, Cu, Ca volumetrically. |
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| **MAT-1111** | **Differential and Integral Calculus** |
|  | **Differential Calculus:** Functions of one variable & their plots, Limit, Continuity, Differentiability, Successive differentiation, Leibnitz’s theorem, Rolle’s, Mean-value, Taylors, Maclurin’s Theorem, Langrange’s& Cauchy’s forms of Reaminder, Expansion of functions in Taylor’s &Maclaurin’s series, Evaluation of Indeterminate form by L’Hospital’ rule, Maxima and Minima of a function, Points of inflexion, Tangent, Normal, Curvature & radius of curvature, Functions of several variables, Partial derivatives, Euler’s theorem, Jacobians, Directional derivatives. **Integral Calculus:** Physical meaning of a integration of function, different techniques of integrations, Integration by parts, Definite integration, Integration by summation of series, Fundamental theorem of integral calculus.  |
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| **MAT-1213** | **Linear Algebra & Complex Analysis** |
|  | **Matrix**: Definition, Types of Matrices, Rank of the Matrix, Equivalence Matrix, System of linear equations**Linear Algebra :** Different types of matrices, Algebraic operations on matrices, Adjoint& inverse of a matrix, Orthogonal & Unitary matrices, System of linear equations, Vector space, Linear transformations, Characteristic roots & vectors, Diagonalization of matrices.**Complex Variable:** De-Moiver’s theorem & its application, Functions of a complex variable, Limit, Continuity & Differentiability of a function of complex variable, Analytic functions, Cauchy-Riemann equations, Cauchy’s theorem, Singularity & poles, Residues, Simple contour integration. |
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| **MAT-1315** | **Differential Equations and Fourier Analysis** |
|  | **Differential equation:** Ordinary differential equation, Formation of DE(=Differential equation), Degree & order of DE, Solutions of 1st& 2nd order ordinary DE, Separable equations, Linear equations, Homogeneous linear equations with constant coefficients, Solution by variation of parameters, Undermined coefficients & operator method, Solution by series.**Laplace Transformation:** Definition of LT(=Laplace transform), LT of different functions, First Shift theorem, Inverse transform, Linearity, Use of first shift theorem & Partial functions, Transform of derivative, Transform of an integral, Heaviside unit function, The 2nd shift theorem, Periodic functions, Convolutions, Solution of ordinary differential equation by Laplace transform.**Fourier Analysis:** Real & Complex form, Finite transform, Fourier integral, Fourier series & convergence of Fourier series, Fourier transform & uses in solving boundary value problem. |
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| **MAT-2111** | **Co-ordinate Geometry and Vector Analysis** |
|  | **Two dimensional geometry:** Transformation of co-ordinates, translation and rotation of axes, invariants, polar co-ordinates, pairs of straight lines, homogeneous second degree equation, general second degree equation, angle between pairs of straight lines, bisectors of angles, general equation of second degree. **Three dimensional geometry:** Co-ordinates in three dimensions, direction cosines and direction ratios, planes, straight lines, spheres.**Vector Analysis**: Vector components, Vector components in spherical & cylindrical system, Derivative of vector, Vector operators, Del, Gradient, Divergence and Curl. Their physical significance, Vector integration, Line, Surface & Volume integration, Green’s &Stoke’s theorem and their applications. |
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| **MAT-2213** | **Probability and Statistics** |
|  | Frequency distribution of data, Population and sample, Collection and representation of statistical data, tabulation of data, class interval, Discrete, continuous and cumulative distribution, histograms, frequency polygon, graphical representation of data, Statistical measures, Sampling, correlation theory, Probability, Stochastic processes. |
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| **EEE-1111** | **Electrical Circuits I** |
|  | Electrostatics, Magnetism, Resistance and capacitance, resistors and capacitors in series and parallel connections, Ohm’s law, Kirchoff’s laws, charging and discharging of a capacitor in RC circuit, Faraday’s law, Inductance and inductor, LR circuit, alternating current: RMS and peak values of A.C. quantities, A.C. circuits with R,L & C, R-L-C series and parallel circuits, resonance in ac circuits, transformer, multiphase circuits, star-delta conversion, Network theorem: superposition theorem, Thevenin’s theorem, Norton’s theorem, maximum power transfer theorem, Transient Analysis of AC circuits: RL, RC and RLC Circuits. |
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| **EEE-1112** | **Electrical Circuits I Sessional** |
|  | Verification of Ohm’s law, Kirchoff’s voltage law, Kirchoff’s current law, Thevenin’s theorem, R-L-C circuits, star-delta conversion. |
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| **EEE-1215** | **Electronics** |
|  | Introduction to semiconductors: P and N type semiconductors, P-N junctions under forward and reverse biases. Diode: Load lines, graphical analysis of diode circuits, equivalent circuits and frequency response, diode applications, half and full-wave rectifiers, bridge rectifiers, clippers, clampers, voltage multipliers, voltage regulators, characteristics of different types of diodes, transistors. |
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| **EEE-1216** | **Electronics Sessional** |
|  | **Instruments:** Measuring Instruments and how to use them, **Ohm’s law and network theorems:** Circuits using resistors, capacitors, inductors and diodes, **Transistor amplifier:** Using Transistor in a circuit as an amplifier, **Transistor as a switch:** Using transistor in circuit as an amplifier. **Use of op-amp:** Familiarizing with Operational Amplifier and building as audio amplifier using op-amp, **Digital Circuits**: Using Logic gates in digital circuits to make flip flops, counters, registers, adders and other components, **Power supply construction:** Making a 5 Volt power supply. |
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| CEE-2110 | **Engineering Drawing** |
|  | Introduction to Engineering Graphics: The Design Process, role of the designer, design documentation, types of drawings, the engineering profession, design communication, examples. Basic Drafting and Lettering: Manual drafting tools, drawing board, T-square, compass, divider, triangles, protractor, drawing templates, French and flex curves, erasing shield, metric and engineering scales, pencil grade, pen sizes and line weights, line types, lettering and sketching, horizontal, vertical and inclined lines, parallel and perpendicular lines, circles and arcs, text in engineering drawings, lettering guidelines. Sketching and Line Techniques: Sketching lines, types of sketches, sketching materials and graph papers, sketching rules, sketching straight lines, sketching circles, sketching ellipses, proportions in sketching, isometric sketching, orthographic sketching. Geometric Construction: Basic geometric elements, triangles, quadrilaterals, polygons, circles and arcs, polyhedra, prisms, cylinders, cones, spheres, bisecting a line or a circular arc, bisecting an angle, transferring an angle, parallel and perpendicular lines, dividing lines, drawing triangles, tangent lines and tangent arcs, conic sections, ellipse, parabola, hyperbola. Multi-view Drawings and orthographic projection: Views of an object, revolving an object, the six regular views, necessary views, two-view drawings, one-view drawings, hidden lines, center lines, alignment of views, meanings of lines, precedence of lines, projection methods, the glass box, folding lines, alternate positioning of views, partial views, revolution conventions, removed views, visualization, surfaces, edges and corners, adjacent areas, similar shapes of surfaces. Auxiliary Views: The auxiliary plane, auxiliary view classifications, uses of auxiliary views, hidden lines in auxiliary views, drawing simplification by auxiliary views, partial and half auxiliary views. Descriptive Geometry: Points, lines and planes, notations, fold lines, projecting a point line into other views, projecting a line into other views, locating a point in space, true length of a line, constructing a point view of a line, finding true distances and true angles, constructing an edge view of a plane surface, visibility of lines, piercing points, intersection of two planes, intersection of a cylinder and a plane surface, intersection of a sphere and a plane surface. |
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| **EEE-2317** | **Digital Electronics** |
|  | Number system and Codes: General way of representing numbers, decimal, binary, octal and hexadecimal number systems and their representation conversion of number from one system to another, compliment in number system, different Codes: BCD, alphanumeric, Gray, Excess-3, ASCII and error detection codes. Digital Logic: Boolean algebra, De-Morgans Theorem logic gates and their truth tables, Canonical form of logic expression, simplification of logic expression: algebraic method, K-Map, realization by using NAND/NOR gates, adders, subtractors, code converters, magnitude comparator encoder, decoder, multiplexer, de-multiplexer, ROM, RAM, Programmable Logic Array (PLA), D/A & A/D converters with applications.  |
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| **EEE-2318** | **Digital Electronics Sessional** |
|  | Logic gates, flip-flops, full adder, counters, registers, decoders, encoders, multiplexers. |
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| **EEE-3211** | **Microprocessor, Assembly Language and Computer Interfacing** |
|  | This course introduces the basics of computer organization and assembly language programming. Topics covered include: basic building blocks of a computer, bus system, microprocessor architecture, memory organization, programming model of a microprocessor, instructions set, and assembly language programming concepts. Mnemonics and opcodes, instruction sets for 8085 and 8086, assembly language programming, arithmetic instructions, logical instructions, loops and arrays, procedures, macros, interrupts, use of assembly language for simple system development. Fundamental units of a microcomputer: Input unit, CPU, Microprocessor, Memory unit, Output unit, Bus structures, and Processor clock. Memory devices: ROM, RAM, EPROM, Microcomputer programming concepts and timing. Architecture of a general purpose microprocessor, INTEL 8086 microprocessor, Internal architecture, Register structure, Addressing modes, Pin diagram and pin descriptions, Timing diagram, Instruction sets, Memory interface, I/O interface, Bus interface, DMA, Interrupts, Analog interfacing and industrial control, An overview of Intel 80186 through Pentium models. |
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| EEE-3212 | **Microprocessor, Assembly Language & Computer Interfacing Lab** |
|  | Laboratory experiments based on EEE 3211 - Exp. 01: Perform 16 bit Arithmetic, Logical and Branching operation with 8085 Microprocessor.Exp. 02: Multiplication and division of two 8 bit numbers using 8085 Microprocessor.Exp. 03: Familiarization with 8086 Microprocessor kit with additional hardware.Exp. 04: Addition and Subtraction using 8086 microprocessor kitExp. 05: Perform some problems relating shifting and arithmetic operation. |
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| **EEE-4127** | **VLSI I** |
|  | P-MOS, N-MOS and C-MOS transistors structures, characteristics and operations, MOS inverter, Fabrication process, Stick diagram, Design rules and layout, Logic circuit design, Dynamic MOS circuits, Memory, Register, Counter, Architecture and implementation of PLDS and PLA, Reliability aspects, Ultra-fast VLSI circuits. P-M0S, N-MOS and C-MOS transistors structures, characteristics and operations, MOS inverter, Fabrication process, Stick diagram, Design rules and layout, Logic circuit design, Dynamic MOS circuits, Memory, Register, Counter, Architecture and implementation of PLDS and PLA, Reliability aspects, Ultra-fast VLSI circuits. |
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| EEE- 4128 | **VLSI I Lab** |
|  | Exp. 1: Introduction to circuit simulation using SPICEEExp. 2: SPICEE simulation of logic gates.Exp.3: Layout design of a CMOS Inverter using MicroWind (µW)Exp. 4: Circuit design by using Verilog CodeExp. 5: Design a 4 bit/8 bit Adder/Subtractor by using DSCH software |
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| **CSE-1111** | **Introduction to Computers** |
|  | Introduction: History and development of computer Science, fundamental concepts, types of computers, a variety of computer applications (Word, Excel, Access, LAN). Hardware: CPU, motherboards, storage media, I/O devices. Software: Basic concepts, types of software. Operating system: Types, Importance, components, and basic functions. Application software: Programming languages, Applications Packages. Maintenance: Power supply, UPS, Virus protections. |
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| **CSE-1112** | **Introduction to Computers Sessional** |
|  | Students should be given a good practical idea programming language using “Python”. |
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| **CSE-1213** | **Computer Programming** |
|  | Introduction to Programming Languages: Machine language, assembly language, mid-level language, high-level language, language translation, interpreter, assembler and compiler. Programming Concepts: Algorithm and logic, flow-chart, keywords, syntax, data object, data types, declaration, operator, identifier, expressions and statements, structure, functions, built-in-functions, I/O functions, control statements, branching, looping, subprogram, storage management. The objective of this course is to enable the students to know the keywords and basic programming techniques in different structured languages. |
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| **CSE-1214** | **Computer Programming Sessional** |
|  | Input and output operations, operators and expressions decision making and branching, use of one, two and multi dimensional arrays, decision making and looping, character strings, functions, pointers and dynamic memory allocations, file management, the preprocessor statements. |
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| **CSE-1215** | **Discrete Mathematics** |
|  | Set theory, relations, functions, vectors, and matrices, graph theory, planar graphs, and trees, directed graphs and binary trees, combinational analysis, algebraic systems, Number theory, languages, grammars and automata, ordered sets lattices, propositional calculus, Boolean algebra, logic gates, lattice and group theory, cyclic group, permutation groups, symmetry groups, quetients, homomorphism, basic structure theory, set and combinatories, prepositional and predicate logic, mathematical reasoning and proof techniques, theories with induction, counting and countability, graphs and trees, morphisms of algebraic structures, modeling computation, program correctness and verification. |
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| **CSE-1315** | **Data Structures** |
|  | Introduction, data structures, data structure operations, mathematical notations and functions, algorithmic notations, control structures, linear data structures, arrays, records, pointers, linked lists, stacks, recursions, queues and their applications, non-linear data structures- trees, graphs and their applications; Sorting and searching- insertion sort, selection sort, merging, merge-sort, radix sort, searching and hashing. |
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| CSE-1316 | **Data Structures Sessional** |
|  | Laboratory works based on CSE-1315. |
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| **CSE-2213** | **Object Oriented Programming** |
|  | Introduction to object oriented programming, C++/JAVA/Python as an object oriented language, Introduction to C++/JAVA, Basic Concepts of Object-Oriented Programming : Object, Class, Inheritance, Encapsulation, Polymorphism, Expressions in C++/JAVA, Statements and Control Structures, Arrays, Functions in C++/JAVA, Classes and Objects, Static Data Members and Member Functions, Arrays of Objects and Friend Functions, Copy Constructor, Dynamic Constructors, Constructing 2-Dimensional Arrays, Operator Overloading and Type Conversions, Introduction to Inheritance, Single Inheritance, Multiple Inheritance, Multilevel Inheritance, Pointers and Virtual Functions, Virtual Functions and Polymorphism, C++/JAVA Streams and Stream Classes, I/O Operations, Managing Output with Manipulators, Classes for File Stream Operations, File Pointers and their Manipulations, File Operations : Insertion, Updating, Exception Handling. |
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| **CSE-2214** | **Object Oriented Programming Sessional** |
|  | Creating Classes and objects, Encapsulation, Static Data members and member functions, Arrays of objects and friend functions, Function Overloading and Polymorphism, Constructors and Destructors, Inheritance: Single, Multiple, Multilevel, Virtual functions and Polymorphisms, File Operations. |
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| **CSE-2117** | **Computer Algorithms and Complexity** |
|  | Techniques for analysis of algorithms, Method for the design of elegant algorithms: divide and conquer, greedy method, dynamic programming, backtracking, branch and bound, Basic search and traversal techniques, graph algorithms, Algebraic simplification and transformations, Lower bound theory, NP-hard and NP-complete problems. |
| **CSE-2118** | **Computer Algorithms and Complexity Sessional** |
|  | Sessional classes will be conducted based on the topics covered in CSE-2117. |
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| **CSE-2319** | **Database Management System** |
|  | Introduction- purpose of database systems, view of data, data models, database languages, transaction management, storage management, database users, overall system structure; Entity relationship model- design issues, mapping constraints, keys, ER diagram, weak entities, extended ER features; Relational model; SQL- basic structures, set operations, aggregate functions, null values, nested subqueries, derived relations, views, joined relations, data definition language, embedded SQL; Integrity constraints- domain constraints, referential integrity, assertions, triggers, functional dependencies; Relational database design- decomposition, normalization, normal forms; Object oriented databases; Indexing and hashing; Concurrency control; Recovery system; Distributed databases. |
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| **CSE-2320** | **Database Management System Sessional** |
|  | The course covers advance topics in databases like query processing and optimization, database security and transaction management, to learn how to develop database applications: Creation of Tables- Simple tables, tables with constraints, use of foreign keys and use of data base triggers; Use of SQL/PLSQL- Usage of SQL commands, usage of built in functions, simple queries, nested queries, procedures and functions; Interfacing with database- Using forms of data entry; Reports- Using report write. |
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| **CSE-2321** | **Data Communication** |
|  | Introduction to communication, Analog and digital data, spectrum and bandwidth, transmission impairments, data rate channel capacity, Transmission media: twisted pair, coaxial and fiber optic cables, Manchester and differential Manchester encoding, ASK, FSK, PSK, QPSK encoding, modems, error detection techniques, Data encoding, Data transmission, Data link, Data communication networking. |
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| **CSE-3111** | **Numerical Methods** |
|  | **Numerical analysis:** Errors in numerical calculations. Error : Definitions, sources, examples. Propagation of Error. A general error formula. **Root finding :** The bisection method and the iteration method, the method of false position. Newton-raphson method. **Methods of approximation theory :** Polynomial interpolation: Lagrange form, divided formula for interpolation. **Solution of systems of Linear equations:** Gaussian elimination. The pivoting strategy, Iteration method solution of tridiagonal systems. **Numerical solution of ordinary differential equations:** Euler's method (including modified form), Rnge-Kutta method. **Numerical Integration:** Trapezoidal method. Simpson's method. Weddle's method; Eigen value problems for matrices, Use of computer to implement projects in numerical methods. |
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| **CSE-3112** | **Numerical Methods Sessional** |
|  | Programming/computing techniques, Matrix solution methods, Solution of simultaneous equations using MATLAB, Modeling of first and second order Mechanical/electrical/thermal systems, Applications of root-finding to vehicle dynamics & thermal insulation, Applications of curve-fitting to experimental data, Applications of numerical integration to evaluate moments of inertia, friction work and volumetric fluid flow. |
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| **CSE-3115** | **Computer Networks** |
|  | An introductory course on theory and practice of computer networking. Topics includes; Introduction: Goals, Applications, Network structures, Network architectures, OSI, Connection oriented and connectionless services, Service primitives. Public networks, ARPANET, SNA, Local Area Networking: Technology, Architecture, Topology, Wireless LAN. LAN system: Ethernet and Fast Ethernet. Token Ring and FDDI. ATM LAN. Wide Area Networking: Circuit switching and Packet switching. ISDN, Frame Relay and cell relay. Data Link Layer: Service provided to the network layer, Framing, Error control, Flow control, Error detection and correction. Communication Architecture and Protocols: Network reference model, TCP/IP protocol, Internetworking, Internet protocol, Routing protocol, Transport protocols. Network Security: Privacy with conventional encryption, Digital signature. Distributed Applications. |
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| **CSE-3116** | **Computer Networks Sessional** |
|  | Client/Server computing on a LAN and LAN Operating Systems, Examples – Linux, Widows 2000 server, MS Workgroups etc. Introductions to web servers, mail servers, authentication servers etc. |
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| **CSE-3117** | **Computer Architecture and Design** |
|  | Processor design: Introduction, processor organization, information representation, number formats, instruction sets, instruction formats, instruction types, fixed point arithmetic, addition, subtraction, multiplication, division, ALU design: basic ALU organization, floating point arithmetic, arithmetic processors. Control design: instruction sequence, instruction interpretation, Hardware control: CPU control unit, micro programmed control, basic concepts, control memory optimization, multiplier control unit, micro programmed computers. Memory organization, review of primary and secondary memories, memory hierarchies, high speed memories, interleaved memories, cache memory. System organization, communications, bus control, I/O systems, programmed i/o device, DMA, interrupts, i/o processors. Parallel processing: basic concepts, types of parallel processors, performance consideration, pipeline processors and systolic arrays, pipeline structures, vector supercomputer, data flow computers, multiprocessor architectures, fault-tolerant computers. RISC processors: introduction to data addressing modes, condition codes, register sets, brief study of RISC processor. |
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| **CSE-3211** | **Operating Systems** |
|  | An introduction to the structure of modern operating systems, History of operating systems, Operation system concept, Computer system structure, Operation system structure, Introduction to processes, Inter-process communication, Threads, CPU scheduling, Deadlocks, Memory management, I/O systems, Storage management, Secondary storage management, Files systems, Protection, Distributed system structure, Distributed coordination, Distributed file systems, Study of a representative operating system : Windows NT, UNIX. |
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| **CSE-3212** | **Operating Systems Sessional** |
|  | Introduction: UNIX system concepts, History, C programming under UNIX, standard C libraries, Single and multi-module programming, UNIX file dependency system, UNIX archive system, UNIX source code control system, UNIX profiler, UNIX debugging, UNIX system programming. File manipulation process creation, Data manipulation, Inter process communication, communication protocols, UNIX domain protocols, Socket addresses, Elementary and advanced socket. UNIX shells, Shell functionality, Shell programming. System calls, System versus transport layer interface. Transport Endpoint addresses, TLI functions, Standard Routines. |
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| **CSE-3213** | **Digital Signal Processing** |
|  | Main features and application of digital signal processing. Introduction to speech, imageand data processing. Discrete time signals, sequences. Linear systems,-Linear constant coefficient difference equations. Sampling of continuous lime signals. Two dimensional sequences and systems. Z-transform, inverse Z-transform, Z-transforms theorems and properties, system function, two dimensional Z-transform. H-transform. Frequency domain representation, discrete time systems and signals, discrete Fourier series and series transform, properties of discrete Fourier transform (DFT). Parseval’s theorem. Equivalent noise definition of bandwidth. Convolution, Correlation and the method of numerical integration. Computation of the DF1: Goertzel FFT, Chirp Z - transform algorithms. Signal flow graph representation of digital networks, Tellegen's theorem. Introduction to digital filters, IIR and FIR digital filter design techniques. Programming the TMS320C30 and TMS 320C40 digital signal processor cards. Probability and Stochastic processes, cards. Probability and Stochastic process, discrete time random process, spectrum representation of infinite energy signals, response of liner systems lo random signals, adaptation algorithms, all-zero, pole-zero and lattice adaptive fillers, applications of adaptive filtering. Introduction to parametric and model leased signal processing . |
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| **CSE-3214** | **Digital Signal Processing Sessional** |
|  | Concepts covered in lecture applied in computer laboratory assignments. |
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| **CSE-3227** | **Theory of Computation** |
|  | Formal models of automata, language and their relationship. Finite automata and regular expressions, properties of regular sets, context-free grammars, push-down automata, properties of context-free languages, Turing machines, halting problem, un decidability and computability, recursive function theory, Chomsky hierarchy, deterministic context-free languages, closure properties families of languages, computational complexity theory, intractable problems, application in parsing, pattern matching and the design of efficient algorithms. Finite state machines, introduction to sequential circuits, basic definition of finite state model, memory elements and their excitation functions, synthesis of synchronous sequential circuits, iterative network, definition and realization of Moor and Melay machines. |
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| **CSE-3315** | **Compiler Design and Construction** |
|  | Fundamentals of compilers, lexical analysis, regular expressions, regular languages, syntax analysis, syntax analysis, context free grammar, bottom-up parsing, syntactic error recovery, syntax-directed definitions, attributes evaluation, abstract syntax trees, symbol tables, type checking, semantic checks for inheritance/subtyping and for overlapping, generation of intermediate code, generation of un-optimized target code. Introduction to code optimization, control flow graphs, live-variable analysis, allocation optimized register, global common sub expression elimination, dominators, loop in control flow graphs, def-use and use-def chains, loops invariant, code motion, partial redundancy elimination, constant propagation, optimizing object-oriented programs, copy propagation, phase ordering of optimizations, instruction scheduling, optimization for memory hierarchies. |
| **CSE-3316** | **Compiler Design and Construction Sessional** |
|  | Introduction, Scanning, Parsing, Semantic Analysis, Code Generation, Runtime Support.Laboratory Projects**:** Implementation of a complete hand written recursive decent compiler and the runtime support system. Implementation language will be C/C++; code generation will be to a synthetic 3-address general register machine language. |
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| **CSE-3317** | **Java Programming** |
|  | Introductory concept of Programming and Approaches, Importance of Java Programming and Object Oriented Concept, Introduction to NetBeans IDE and simple programs, Character Set, Identifiers, Variables, Constants, Data types, Operators, Expressions, Statement, Program Flow, Control Statement, Selection (If Structure), Rest of Selection (Nested if, Switch), Break Statement, Console input and related conversion methods, Loop, Access specifier, Instance variables, constructor, Methods, Polymorphism, Inheritance, Abstract Methods and class, Exception and String Handling, GUI Components, Event Handling, Threads and Multithreading, History of JAVA class libraries, Methods: Program module in JAVA, math class method, method definitions, JAVA API packages, automatic variables, recursion, method overloading, method of applet class. Array: Declaring and allocating arrays, passing arrays to methods, sorting arrays, Object based programming and object oriented programming in JAVA, Java Database Connectivity. |
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| **CSE-3318** | **Java Programming Sessional** |
|  | Simple Java programs, Introduction to NetBeans IDE, Control structures, Constructor, Methods, Polymorphism, Inheritance, Exception handling, Abstract methods and class, GUI Components, Threads and Multithreading, Recursion, Method overloading, Array operations, Java Database Connectivity. |
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| **CSE-3319** | **Software Engineering & Information System Design** |
|  | Concepts of Software Engineering, Software Engineering paradigms, Different phases of software System Development, Different types of information, qualities of information. Project Management Concepts, Software process and project Metrics, Software Project Planning, Risk Analysis and management, Project Scheduling and Tracking. Analysis Concepts and principles: requirement analysis, Analysis modeling, data modeling. Design concepts and principles, Architectural design, User Interface design, Object Oriented software development and design: Iterative Development and the Unified Process. Sequential waterfall life cycles, Inception. Use case model for requirement writing, Elaboration using System Sequence Diagram, Domain Model. Visualizing concept classes. UML diagrams, Interaction and Collaboration Diagram for designing Software. Designing Objects with responsibilities. GRASP patterns with General Principles in assigning responsibilities: Information expert, Creator, Low Coupling and High Cohesion, Creating design class diagrams and mapping design to codes. Advanced GRASP patterns: Polymorphism, Pure Fabrication, Indirection, Project Variation. GoF Design Patterns: Adapter, Factory, Singleton, Strategy, Composite, FaÃ§ade, and Observer. Software Testing: White Box and Black Box testing. Basis Path Testing. Testing for specialized environment. Software testing strategies: Unit Testing, Integration Testing, Validation Testing, System Testing, Art of debugging. Analysis of System Maintenance and upgrading: Software repair, downtime, error and faults, specification and correction, Maintenance cost models, documentation. Software Quality Assurance, Quality factors. Software quality measures. Cost impact of Software defects. Concepts of Software reliability, availability and safety. Function based metrics and bang metrics. Metrics for analysis and design model. Metrics for source code, testing and maintenance. |
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| **CSE-3320** | **Software Engineering & Information System Design Sessional** |
|  | Software Engineering lab works is solely designed to attain hands on experience of architectural design, documentation and testing of software so that students can develop the software following the documents only.**Step1 (Requirement Engineering)**: Choose a company/institute/client for which software will be developed (make sure that they will provide required information whenever necessary). Follow the steps for eliciting requirements and generate use-case diagram. Also analyze the sufficiency of the requirement engineering outcome for steps to follow.**Step 2 (Analysis model to Architectural and Component level design)**: Generate Activity diagram, Data flow diagram (DFD), Class diagram, State diagram, Sequence diagram and follow other relevant steps for creating complete architectural and component level design of the target software.**Step 3 (User Interface design, Design evaluation, Testing strategies and Testing Tactics)**: Perform the user interface design with the help of swimlane diagram. Carry out the design evaluation steps. Generate all test cases for complete checking of the software using black box, white box testing concept.**Step 4 Software testing and debugging****Step 5 (Managing Software Projects)**: Analyze the estimation and project schedule. |
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| **CSE-4111** | **Management Information System** |
|  | An introduction to Management Information System, Information System for Management Activity and Functional Sub-systems, Structure of MIS, Organization and management concepts, Concepts of Information, Systems Concepts, Computer Hardware and Software for MIS, Communications technology for MIS, Data Resource Management, Decision making process, Human as information processors, Concepts of Planning and Control, Support systems for planning, control and decision making, Support systems for Management, Development of Information System Plan, Database requirements, User Interface requirements, Developing and Implementing Applications, Quality Assurance and Evaluations of Information systems, Organizing and Managing Information Resources function. |
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| **CSE-4113** | **Computer Graphics** |
|  | Introduction: History of computer graphics, Applications, Graphics hardware and software, fundamental idea behind modern computer graphics. Geometric Transformation: 2D and 3D Rotation and Translation. Projective Transformation: Orthogonal and Perspective Projection. Vector: Normal Vector and its impact on 3D graphics, View Vector. Raster Graphics: Line Drawing, Polygon Filling, Scan Conversion. Shade models: Light models, Diffused Light, Ambient Light, Specular Light, Flat Shading, Lambert Shading, Phong Shading. Ray Tracing: Basic idea, Hidden Surface Removal, z-buffering. Texture Mapping: Texture Fundamentals, Texture Blending, Curves and Surfaces: Types of Curves, Cubic-Spline, β-Spline, NURBS, Animation: Real time animation, Hardware for real-time animation, Character Animation, Computer Games, Movies, Image Formats: PPM, BMP, Image Based Rendering, Morphing: View-morphing, Volume Metamorphosis. |
| **CSE-4114** | **Computer Graphics Sessional** |
|  | 2D and 3D rotation and translation, orthogonal and perspective, polygon filling, scan conversion, line drawing and computer games. |
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| **CSE-4119** | **Artificial Intelligence** |
|  | An introductory description to the major subjects in artificial intelligence. Introduction to AI languages: LISP, PROLOG. Heuristic search, Knowledge representation and computer interference, Computational logic, knowledge engineering and expert systems, Machine Learning, Natural language processing, Pattern recognition, Computer vision, Robotics Application, social impacts. Inconsistencies and Uncertainties, Probabilistic reasoning, Knowledge acquisition. |
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| **CSE-4211** | **Web Technologies** |
|  | Topics include HTML and DHTML concepts, HTML tag emulation, commands, HTML form design, homepage design, online request, dynamic function, buttons, and animation. Common gateway interface programming: Java Script, programming concept using Javascript, embedding Javascript in HTML. Multimedia: Web graphics, animation, compressed graphics, Socket programming, socket for client server architecture, multi socket RMI, Servlet programming. Online applications: Monitoring user events, database connectivity, and plug-ins. |
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| **CSE-4212** | **Web Technologies Sessional** |
|  | HTML, DHTML, Flash, Javascript, layers, CSS, XML, databases, mySQL, Java, Adobe Dreamweaver, Adobe Photoshop, PHP, Ruby on Rails, jQuery, AJAX, Web Services, and Web Frameworks. |
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| **CSE-4213** | **Optical Fiber Communication** |
|  | **Optical fiber:** Nature of list, Optics low, Optical fiber mode, Single mode fiber, Graded index structure. **Signal degradation in optical fibers:** Attenuation, Signal distortion, Pulse Broadening mode coupling. **Optical sources:** LED, Laser diodes, Light source linearity modal partition and reflection noise. **Power launching and Coupling:** Source to fiber power launching, lansing scheme, fiber to fiber joints, Splicing fiber connectors. **Photodetectors:** Basic principle, photodelectors noise, response time, Avalauch multiplication noise. **Optical receiver operation:** Receiver configuration, digital receiver performance preamplifiers. **Digital transmission system:** Point to point link, line coding, Eye pattern, system performance. **Advanced systems and techniques:** WDM, Local area networks, Optical amplifier, Photonic switching. |
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| **CSE-4215** | **Distributed Systems** |
|  | Distributed object systems, Retrieving and caching of distributed information, Distributed data replication and sharing, Performance issues, Algorithms for deadlock detection, Concurrency control and synchronization in distributed system, Models for distributed computation, Networking facilities and resource control and management methods in network and distributed operating systems, Collaborative applications, Wide area network computing, Web based commerce, Agent systems and Market based computing. |
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| **CSE-4216** | **Distributed Systems Sessional** |
|  | Laboratory Works Based on CSE-4215.  |
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| **CSE-4217** | **Open Source Tools & Techniques** |
|  | Culture/Philosophy of FOSS, Project Hosting (e.g. GitHub, Bitbucket, Google Code, etc.), Version Control, Projects in Need of Help, Protecting Projects from Toxic People, Documentation Tools (LaTeX, LyX, OpenOffice, DocBook, TEI), Linux and FOSS from the ground up Oss, Turning your Mac or Windows box into a FOSS environment, The Languages of FOSS (e.g. Perl, Python, Ruby, C/C++, Haskell), These choices reflect my personal preferences and take nothing away from other good languages (e.g. Java, C#, and languages based on them), You may use any language you like in this class, Virtualization, Code Walkthroughs, Collaboration Technologies, Project Management, Continuous Integration, Cloud Hosting, Packaging (jars, eggs, etc.), Automatic Building (autoconf/make, Python setuptools, Ant, Maven), Project Ideas. |
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| **CSE-4219** | **Object Oriented Software Development Using UML** |
|  | Survey of the paradigm including analysis, design and implementation,demonstrate the importance of modeling in the software development life cycle, become conversant with the UML notation and symbols,understand the object-oriented approach to analyzing and designing systems and software solutions,employ the UML notation to create effective and efficient system designs.The Unified Modeling Language (UML) provides a common, standard notation for recording both analysis models and design artifacts. |
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| **CSE-4220** | **Object Oriented Software Development Using UML Sessional** |
|  | Laboratory Works Based on CSE-4219. |
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| **CSE-4221** | **Simulation & Modeling**  |
|  | 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 discreet-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 simulated outputs, input modeling; Generating random numbers and random variants; Output analysis. Simulation languages; Analysis and modeling of some practical systems. |
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| **CSE-4222** | **Simulation and Modeling Sessional** |
|  | Laboratory Works Based on CSE-4221. |
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| **CSE-4223** | **Neural Network & Fuzzy Logic** |
|  | **Hopfield Model:** Associative Memory, Stochastic Networks, Correlated Patterns. **Introduction:** Neuroscience, History and Issues. **Optimization Problems:** Weighted Matching Problem, Traveling Salesman Problem. **Neural Network:** Feed-Forward Network, Multi-Layer Network. **Unsupervised Learning:** Hebbian Learning, Competitive learning. |
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| **CSE-4225** | **Advanced Algorithms** |
|  | Randomized Algorithms: Las Vegas and Monte Carlo Algorithms; Randomized Data Structures: Skip Lists; Amortized Analysis: Different methods, Applications in Fibonacci Heaps; Lower Bounds: Decision Trees, Information Theoretic Lower Bounds, Adversary Arguments; Approximation Algorithms: Approximation Schemes, Hardness of Approximation; Fixed Parameter Tractability: Parameterized Complexity, Techniques of designing Fixed Parameter Algorithms, Examples; Online Algorithms: Competitive Analysis, Online Paging Problem, k-server Problem; External Memory Algorithms; Advanced Data Structures: Linear and Non-linear Methods.  |
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| **CSE-4227** | **Graph Theory and Applications** |
|  | Graphs: simple graphs, digraphs, sub-graphs, vertex-degrees, walks, paths and cycles; Trees, spanning trees in graphs, distance in graphs; Complementary graphs, cut-vertices, bridges and blocks, k-connected graphs; Euler tours, Hamiltonian cycles, Chinese Postman Problem, Traveling Salesman Problem; Chromatic number, chromatic polynomials, chromatic index, Vizing’s theorem, planar graphs, perfect graphs. |
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| **CSE-4228** | **Graph Theory and Applications Sessional** |
|  | Laboratory Works Based on CSE-4227. |
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| **CSE-4229** | **Computer-Aided Design and Manufacturing** |
|  | Computer-aided engineering software that addresses the hierarchy of engineering analysis, design, and decision evaluation is developed with state-of-the-art computer tools. Linear graph theory is applied to the modeling of physical networks. Operator overloading, dynamic polymorphism, graphical user interfaces, dynamic link libraries, and multiple threaded programs are considered. |
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| **CSE-4230** | **Computer-Aided Design and Manufacturing Sessional** |
|  | Laboratory Works Based on CSE-4229.  |
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| **CSE-4231** | **Data Warehousing and Data Mining** |
|  | 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. |
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| **CSE-4233** | **Machine Learning** |
|  | **Introduction:**Definition of learning systems. Goals and applications of machine learning. Aspects of developing a learning system- training data, concept representation, function approximation.   **Inductive Classification:**The concept learning task. Concept learning as search through a hypothesis space. General-to-specific ordering of hypotheses. Finding maximally specific hypotheses. Version spaces and the candidate elimination algorithm. Learning conjunctive concepts. The importance of inductive bias. **Decision Tree Learning:**Representing concepts as decision trees. Recursive induction of decision trees. Picking the best splitting attribute: entropy and information gain. Searching for simple trees and computational complexity. Occam's razor. Over fitting, noisy data, and pruning. **Experimental Evaluation of Learning Algorithms:**Measuring the accuracy of learned hypotheses. Comparing learning algorithms- cross-validation, learning curves, and statistical hypothesis testing. **Computational Learning Theory:**Models of learnability- learning in the limit; probably approximately correct (PAC) learning. Sample complexity- quantifying the number of examples needed to PAC learn. Computational complexity of training. Sample complexity for finite hypothesis spaces. PAC results for learning conjunctions, kDNF, and kCNF. Sample complexity for infinite hypothesis spaces, Vapnik-Chervonenkis dimension. **Rule Learning, Propositional and First-Order:** Translating decision trees into rules. Heuristic rule induction using separate and conquer and information gain. First-order Horn-clause induction (Inductive Logic Programming) and Foil. Learning recursive rules. Inverse resolution, Golem, and Progol. **Artificial Neural Networks:**Neurons and biological motivation. Linear threshold units. Perceptrons: representational limitation and gradient descent training. Multilayer networks and back propagation. Hidden layers and constructing intermediate, distributed representations. Over fitting, learning network structure, recurrent networks. **Support Vector Machines:**Maximum margin linear separators. Quadratic programming solution to finding maximum margin separators. Kernels for learning non-linear functions. **Bayesian Learning:**Probability theory and Bayes rule. Naive Bayes learning algorithm. Parameter smoothing. Generative vs. discriminative training. Logisitic regression. Bayes nets and Markov nets for representing dependencies. **Instance-Based Learning:**Constructing explicit generalizations versus comparing to past specific examples. k-Nearest-neighbor algorithm. Case-based learning. **Text Classification:**Bag of words representation. Vector space model and cosine similarity. Relevance feedback and Rocchio algorithm. Versions of nearest neighbor and Naive Bayes for text. **Clustering and Unsupervised Learning:**Learning from unclassified data. Clustering. Hierarchical Aglomerative Clustering. k-means partitional clustering. Expectation maximization (EM) for soft clustering. Semi-supervised learning with EM using labeled and unlabeled data.**Core Text**1. Machine Learning, [Tom Mitchell](http://www.cs.cmu.edu/~tom), McGraw Hill, 1997.
2. Introduction to machine learning (2nd edition), Alpaydin, Ethem, MIT Press, 2010
3. An Introduction to Support Vector Machines and Other Kernel-based Learning Methods, Nello Cristianini and John Shawe-Taylor, Cambridge University Press

**Supplementary Text**1. Artificial Intelligence: a modern approach (2nd edition), Russell, S. and P. Norvig, Prentice Hall, 2003
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| **CSE-4234** | **Machine Learning Sessional** |
|  | Students should learn the methods for extracting rules or learning from data, and get the necessary mathematical background to understand how the methods work and how to get the best performance from them. To achieve these goals student should learn the following algorithms in the lab: K Nearest Neighbor Classifier, Decision Trees, Model Selection and Empirical Methodologies, Linear Classifiers: Perception and SVM, Naïve Bayes Classifier, Basics of Clustering Analysis, K-mean Clustering Algorithm, Hierarchical Clustering Algorithm. Upon completion of the course, the student should be able to perform the followings: a. Evaluate whether a learning system is required to address a particular problem.b. Understand how to use data for learning, model selection, and testing to achieve the goals.c. Understand generally the relationship between model complexity and model performance, and be able to use this to design a strategy to improve an existing system.d. Understand the advantages and disadvantages of the learning systems studied in the course, and decide which learning system is appropriate for a particular application.e. Make a naive Bayes classifier and interpret the results as probabilities.f. Be able to apply clustering algorithms to simple data sets for clustering analysis. |
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| **CSE-4311** | **Cellular Mobile and Satellite Communication** |
|  | Orbital aspects: Tracking and control of communication satellite, Launch vehicles: Ariance, Space shuttle, Propagation characteristics: Attenuation and noise, Frequency bands, Satellite transponders: Intermediation low noise amplifiers: Satellite antennas, Earth station configuration, High power amplifiers antenna, LNA: Link design, Multiple access, FDMA, TDMA. CDMA, SPADE, Spot beam antenna, INTELSATs, INSAT. |
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| **CSE-4313** | **Image Processing and Computer Vision** |
|  | Introduction to image processing and computer vision: Representation of image, a basic image processing system, relationship to human visual system, computer vision applications, signal processing and pattern recognition. Discrete Fourier transform: One dimensional Fourier transform, properties of DIT, Fast Fourier Transform(FFT) algorithms, two dimensional FFT, two dimensional filtering using FFT, properties of digital images, two dimensional infinite impulse response filters.Two dimensional system; Techniques of image acquisition; Image enhancement; Image restoration and data compression; Remote sensing application. |
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| **CSE-4315** | **Computer Security & Cryptography** |
|  | Introduction, differences between policies and mechanisms, fundamental categories of security policies, security goals, Use set theoretic concepts to explain principle concepts and models of computer security Access Control Matrix Model, Principle of Attenuation in evaluating security models, Take-Grant Protection Model,  Show that the Take-Grant model is an instance of the Schematic Protection Model, Use the SPM for safety analysis, role of trusting security policies, risks of overextending trust in naively constructed models, various high-level and low-level policy languages, goals of confidentiality policies, Bell-LaPadula confidentiality model, Basic Security Theorem and the rules of transformations, Lipner's five requirements for integrity policies, integrity models developed by Biba, especially the Low-Water-Mark Policy and the Strict Integrity Model, Clark-Wilson Integrity Model, differences between the Chinese Wall Model and the models that are most similar (BLP and Clark-Wilson), principles of noninterference and no deducibility, principles of Least Privilege, Fail-Safe Defaults, Economy of Mechanism, Complete Mediation, Open Design, Separation of Privilege, Least Common Mechanism, and Psychological Acceptability, how access control mechanisms are implemented in a popular operating system such as Windows or Linux, principle mechanisms of Capabilities, Access Control Lists, and Locks and Keys, entropy is used to measure information flow, Confinement Problem, goals and objects of assurance models, Cryptography ( uses and Limitations), System security, Database security, Privacy, Anonymity, Programming Language Security, Network Security, Web security, Network security in practice, pseudorandom permutations and functions, difference between information theoretic and complexity theoretic security, message-authentication code (MAC), Merkle-Damgard construction and theorem. |
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| **CSE-4317** | **Human Computer Interaction** |
|  | Topics include the underlying theories of human-computer interaction, design principles,Guidelines, evaluation, and social and individual impact. Applications studies includethe World Wide Web. Practical work: Project using a language such as Delphi or VisualBasic. |
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| **CSE-4319** | **Advanced Operating Systems** |
|  | An Overview of operating system functions, Information management, Process management, Memory management and secondary storage space management, Parallel processing, distributed operating systems, Introduction, Design issues, Distributed shared memory, Algorithms of implementing distributed scheduling, Failure recovery and Fault tolerance, Protection& Security, Resource security & Protection, Data Security, Cryptography, multiprocessor operating systems, Introduction, Architecture, Interconnection Network for multiprocessing caching, Structure of multiprocessing operating system, threads, various types of threads, Design issues, Case study of any machine operating systems, database operating system, Introduction requirements of a Data base operating system, concurrency control Introduction, Transactions, Conflicts, Transaction processing, The problem of concurrency control, Searializability theory; Logs, serial logs, Log equivalence, sample concurrency control algorithms. Object oriented operating systems and its characteristics, Case study of OS such as Unix OS, Netware OS, Windows-NT, etc. |
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| **CSE-4320** | **Advanced Operating System Sessional** |
|  | Laboratory works based on Advanced Operating System. |
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| **CSE-4321** | **Decision Support System** |
|  | Introduction to decision support systems; DSS components; Decision making and DSS; DSS software and hardware; developing DSS; DSS models; types of DSS; group DSS; executive information systems; data mining; artificial intelligence and expert systems. |
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| **CSE-4322** | **Decision Support System Sessional** |
|  | Laboratory works based on Decision Support System. |
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| **CSE-4323** | **Introduction to Robotics** |
|  | Introduction to Robotics. Vision: Projection, Convolution, Edge Detection, Image Interpretation and ENS. Mobility - (mobile robot platforms). Inertial Navigation Systems. Graph Search. Controls (and encoders). Motion Planning: Potential Functions, Roadmaps, Cell Decompositions. Sensing and Sensors. Human Robot Interaction. Forward and Inverse Kinematics: Transformation Matrices. Inverse Kinematics: Geometric methods, Algebraic methods. Non-holonomic constraints. |
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| **CSE-4324** | **Introduction to Robotics Sessional** |
|  | Laboratory works based on Introduction to Robotics. |
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| **CSE-4325** | **Multimedia communication** |
|  | Multimedia system-introduction; Coding and compression standards; Architecture issue multimedia; Operating systems 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 multimedia document; Networking issues in multimedia - Quality-of-service guarantees, resource reservation traffic specification, happing, and monitoring, admission control; Multicasting issues; Session directories; Protocols for controlling sessions; Security issues in multimedia -digital water – making partial encryption schemes for video streams; multimedia applications – audio and video conferencing, video on demand, voice over IP. |