Course details: 2nd Year Odd Semester

ECE 2103 Data Structure & Algorithms Credits : 3

Data Structure

Introduction: Concepts and Examples of Elementary Data Objects, Necessity of Structured Data, Types of Data Structure, Ideas on Linear and Nonlinear Data Structure.

Linear Array: Linear Array & its representation in memory, Traversing LA, Insertion & Deletion in LA, Bubble Sort, Linear Search & binary Search, Multidimensional Array & its representation in memory, Algebra of matrices, Sparse matrices.

Stack and Queue: Stack representation & applications; PUSH and POP operation on stack; Queue representation, Insertion & deletion in Queue, Priority Queues.

Linked List: Linked list & its representation in memory, Traversing, Searching, Insertion & Deletion operation on Linked list, Circular List, Header linked lists, Two way lists.

Tree: Tree terminology, representation of binary trees in memory, Traversing binary tree, Binary search tree, Insertion & deletion on binary search tree, B trees, General tree.

Algorithm

Complexity: Algorithm and flow chart, Complexity analysis of algorithms, worst case, best case and average case, Rate of growth, Big-O notation, Complexity of Linear Search & Binary search.

Sorting Algorithms: Insertion sort, selection sort, quick sort, merge sort, Searching & data modification, Hash function, collision resolution, Chaining.

Shortest Path: Dijkstra‟s Algorithm, Bellman-Ford Algorithm.

Searching algorithms: Binary search trees, balanced binary search trees, B-trees, skip lists, hashing. Priority queues, heaps.

Graph algorithms: Representation of Graphs, Breadth First Search, Depth First Search, Minimum Spanning Tree..

Recurrences & Backtracking: Recurrences, NP-Hard and NP-Complete Problems, Backtracking, n-Queen Problem.

ECE 2104 Data Structure & Algorithms Sessional Credits : 1.50

Sessional based on the theory of course ECE 2103.

ECE 2107 Electrical Machines I Credits : 3

Transformer: Ideal transformer- transformation ratio, no-load and load vector diagrams; actual transformer-equivalent circuit, regulation, short circuit and open circuit tests. Three phase transformer and its connections; Vector group of three phase transformers; Phase conversion.

Three Phase Induction Motor: Rotating magnetic field, equivalent circuit, vector diagram, torque-speed characteristics, effect of changing rotor resistance and reactance on torque-speed curves, motor torque and developed rotor power, no-load test, blocked rotor test, starting and braking and speed control; Induction generator.

Single Phase Induction Motor: Theory of operation, equivalent circuit and starting.

ECE 2108 Electrical Machines I Sessional Credits : 0.75

Sessional based on the theory of course ECE 2107.

ECE 2111 Digital Techniques Credits : 3

Information and digital Systems: Introduction to digital systems, Number Systems, weighted and non-weighted codes, error detection code, Binary addition and subtraction, 2's compliment methods.

Boolean Algebra and Combinational Logic Circuits: Digital logic, Boolean algebra, Boolean function, Canonical forms, Karnaugh Maps, Minimization of Boolean functions, Logic gates and their truth tables, Design methodologies, Combinational logic circuit design, Arithmetic and data handling logic circuits. Decoders, Encoders, Multiplexer, Demultiplexer.

Flip Flop and Sequential Logic Circuits: Transistor Latch, NAND gate latch, NOR gate latch, D latch. Clock signals and Clocked FFs: Clocked SR, JK and D Flip-Flops, Master/Slave JK FF, timing diagram of different FFs, Edge-triggered and level-triggered timing diagrams. , Counters, registers, memory devices and their applications.

Technology parameters: Fan in, Fan out, Propagation delay, Power dissipation and noise immunity.

Others: Diode logic gates, transistor gates, MOS gates, Logic Families: TTL and CMOS logic with operation details.

ECE 2112 Digital Techniques Sessional Credits : 0.75

Sessional based on the theory of course ECE 2111.

Math 2117 Vector Analysis & Linear Algebra Credits : 3

Vector Analysis: Vectors, Differentiation and integration, Line, surface and volume integrals, Gradient of a function, Divergence and curl of vector and their applications, Physical significance of gradient, divergence and curl, Vector identities, Integral forms of gradient, divergence and curl, Green's theorem, Stock's theorem, Gauss's Divergence theorem.

Matrix: Definition of matrices, Equality of two matrices, Addition, Subtraction and Multiplication of matrices, Equivalence of Matrices, Positive and Negative Matrices, Adjoint of matrices, Transpose and inverse of matrices, Rank and normal form of matrices, System of Linear Equations, Solution of Homogeneous and non-homogeneous systems, Determination of Eigen values and Eigen vectors, Solutions of matrix differential equations.

Linear Algebra: Vector Space, Subspace, Sum and Direct sum, Hilbert space, Normed linear space, Branch space, Basis and Dimension. Linear transformation: Range, Kernel, Nullity, Singular and Non-singular transformation. Linear operations: Matrix representation of a linear operator. Change of basis, Similarity and linear mapping.

Chem 2117 Inorganic and Physical Chemistry Credits : 3

Inorganic chemistry

Atomic structure- general concept of fundamental particles, Boh'r model, spectrum, quantum number, and electronic configuration.

Periodic table and periodic properties- periodic law, features of modern periodic table, classification of elements, merits and demerits, periodicity, atomic size, ionization potential, electron affinity, and electronegativity.

Chemical bonding- different types of chemical bonds and their properties. Acid and bases- modern concepts of acid and bases, pH and buffer solution. Titration.

Physical chemistry

Solution- Types and composition of solution, Henry's law, solution of gas in liquid, solid in liquid, colligative properties of dilute solution lowering of vapour pressure, elevation of boiling point, depression of freezing point, osmosis and osmotic pressure.
Chemical kinetics- rate of reaction, order, molecularity, different types of rate expressions, effect of temperature on reaction rate, collision theory.
Chemical equilibrium- reversesible reaction, law of mass action, evaluation and characteristics of equilibrium constant of reaction, the Lechatelier's principle.
Thermochemistry- laws of thermochemistry, heat of reaction, heat of solution, heat of neutralization, heat of formation, heat of combustion, experimental determination of thermal changes during chemical reactions.
Electrochemistry- electrolytes, mechanism of electrolyte conduction and different types of cells.

Chem 2118 Inorganic and Physical Chemistry Sessional Credits : 0.75
Sessional based on the theory of course Chem 2117.

ECE 2100 Software Development Project I Credits : 0.75
Students will develop one or more programs / projects on some practical problems with sound software engineering practices as assigned by teacher.