CSE 2201	**Contact hours/week: 3**
Computer Algorithms	**Credits: 3.00**

Prerequisite: CSE 1201, CSE 2101

Asymptotic Notations: Complexity Analysis of Algorithms, Worst Case, Best Case and Average Case.

Sorting Algorithms: Divide and Conquer Approach, Merge Sort and Quick Sort Algorithm, Complexity Analysis, Worst and Average Case Analysis, Heap Construction Algorithm, Heap Sort, Application of Heap: Priority Queue, Decision Tree Model and (Worst Case) Lower Bound on Sorting, Sorting in Linear Time - Radix Sort, Bucket Sort, Counting Sort, etc.

Graph Algorithms: Representation of Graphs, Breadth First Search, Depth First Search,Minimum Spanning Tree, Kruskal and Prims Algorithm.

Shortest Path: Dijkstra's Algorithm, Bellman-Ford Algorithm. Floyd Warshall Algorithm.

Searching Algorithms: Binary Search Trees, Balanced Binary Search Trees, AVL Trees and Red-Black Trees, B-Trees, Skip Lists, Hashing. Priority Queues, Heaps, Interval Trees.

Dynamic Programming: Longest Common Subsequence (LCS), Matrix Chain Multiplication (MCM), Knapsack Problem, Multistage Graphs.

Greedy Algorithm: Greedy Algorithm, Activity Selection Problem, Huffman Codes and its application, Knapsack problem, Tree Vertex Splitting.

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

Reducibility between Problems and NP-completeness: Lower Bound Theory, Discussion of Different NP-Complete Problems like Satisfiability, Clique, Vertex Cover, Independent Set, Hamiltonian Cycle, TSP, Knapsack, Set Cover, Bin Packing, etc. Computational Geometry, Line Segment Properties, Convex Hull, Graham Scan Algorithm of Convex Hull.

CSE 2202	**Contact hours/week: 3**
Sessional based on CSE 2201	**Credits: 1.50**

Prerequisite: None

Sessional based on the theory of course CSE 2201.

CSE 2203	**Contact hours/week: 3**
Digital Techniques	**Credits: 3.00**

Prerequisite: None

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.

CSE 2204   Contact hours/week: 3
Sessional based on CSE 2203   Credits: 1.50
Prerequisite: None
Sessional based on the theory of course CSE 2203.

CSE 2205   Contact hours/week: 3
Finite Automata Theory   Credits: 3.00
Prerequisite: None
Finite State Machine: Fundamental of Finite State Machine, State Equivalence and Minimization of Machine, Incompletely Specified Machine and Minimal Machine, Merger Graph and Compatibility Graph, Finite Memory and Definite Memory Machine, Information Lossless Machine and Inverse Machine.

Finite Automata: Introduction to Finite Automata, Structural Representations, Automata and Complexity, an Informal Picture of Finite Automata, Deterministic Finite Automata, Non-Deterministic Finite Automata, an Application (i.e. Text Search or other), Finite Automata with Epsilon-Transitions.

Regular Expressions and Languages: Regular Expressions, Finite Automata and Regular Expression, Application of Regular Expressions, Algebraic Laws for Regular Expressions; Closure Properties of Regular Language, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.

Context-Free Grammar and Languages: Context-free Grammars, Parse Trees, Application of Context-Free Grammars, Ambiguity in Grammars and Languages, Normal Forma for Context-Free Grammars, The Pumping Lemma for Context-Free Languages, Closure Properties of Context-Free Languages, Decision Properties of CFL's.

Pushdown Automata: Definition of the Pushdown Automata, the Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata.

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

Undecidability: A language that is not recursively enumerable, an undecidable problem that is RE, undecidable problems about turing machines, post's correspondence problem, other undecidable problems.

CSE 2206   Contact hours/week:3/2
Sessional based on CSE 2205   Credits: 0.75
Prerequisite: None
Sessional based on the theory of course CSE 2205.

EEE 2251   Contact hours/week: 3
Electrical Machines and Instrumentations   Credits: 3.00
Prerequisite: EEE 1151
DC Machines: Operation and Performance Characteristics of Generators and Motors. Starting, Speed Control and Braking of Motors. Different Application of DC Motors.
AC Machines: Transformer: Principle of Operation of Transformer. Single Phase Induction Motors and its Methods Of Starting.
Synchronous Machines and Motors: Principles of Operation and Equivalent Circuit. Method of Synchronization. Special Motors: Stepper Motor, Servomotor, Brush Less Motors.
Measuring Instruments: Electromechanical and Electronic Meters and their Uses. Extension of Instrument Range.
Transducers: Different Types of Transducers and their Principle of Operations: Position and Displacement Transducers, Potentiometer, Linear Variable Differential Transformers (LVDT), Pressure Transducer, Temperature Transducer, Optical Transducer, Ultrasonic Transducer; Humidity Transducer, Hall Effect Transducer, and Speed Transducer.

EEE 2252   Contact hours/week: 3/2
Sessional based on EEE-2251   Credits: 0.75
Prerequisite: None
Sessional based on the theory of course EEE 2221.

Math 2213   Contact hours/week: 3
Complex Variable, Differential Equations and Harmonic Analysis   Credits: 3.00
Prerequisite: None
Complex Variable : Complex Number Systems, General Functions of a Complex Variable, Limits and Continuity of a Function of Complex Variable and Related Theorems , Complex Differentiation and the Cauchy-Riemenn Equations, Infinite Series, Convergence, Line Integral, Cauchy Integral Theorem, Cauchy Integral Formula, Liouville's Theorem, Taylor's and Laurent's Theorems, Singular Points, Residue, Cauchy's Residue Theorem, Contour Integration.
Differential Equations: Series Solution: Singular Points, Series Solutions: Frobenius

Method, Bessel's and Legender's Differential Equations.
Partial Differential Equation: Partial Differential Equations, Solution of First Order Partial Differential Equation by Lagrange and Charpit Methods, Solution of Laplace Equation and Wave Equation.
Harmonic Analysis and Laplace Transform: Fourier Series and Fourier Transformations and its Applications to Solve Boundary Value Problems. Laplace Transforms, Inverse Laplace Transforms, Solution of Differential Equation by Laplace Transforms.