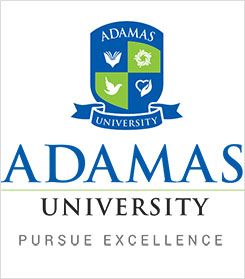
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**ADAMAS UNIVERSITY**

**Master of Computer Application (MCA)**

**SEMESTER I**

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| **Numerical and Statistical Methods** | **SMA51141** | **3-1-0** | **4 Credits** |

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| **Module 1:**  **Statistics:** definition, scope and limitation, presentation of data, diagrammatic and graphical representation of data, measures of central tendency, mean, median and mode, geometric and harmonic mean and their limitations, Measure of variations, Range, Quartile, Variance, Standard deviation, Skewness, moment and Kurtosis.  **Correlation and Regression:** Introduction to Correlation analysis, Karl Pearson correlation coefficient, Rank Correlation, Regression Analysis, Fitting Straight Lines, Method of least square, regression coefficients, properties of regression coefficients and applications. | | **[16]** |
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| **Module 2:**  **Probability:** Introduction, Probability of an event, additive rule & multiplication rule, conditional probability Bayes’ rule and applications.  **Probability Distributions:** Random variable, discrete and continuous probability distribution, Mathematical expectation, Variance of a random variable, Binomial, Hyper-geometric, Geometric, Poisson distribution, Uniform, Normal, Exponential Distribution.  **Test of hypothesis:** Introduction, type I and type II Error, one and two tailed test, test on a single mean when variance is known & variance is unknown. Test on two means, test on a single mean population and test on two populations, one and two sample test for variance, -Test for goodness of fit and test for independence. | | **[18]** |
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| **Module 3:**  **Numerical Methods:** Introduction, Concept of Errors, Bisection Method, False Position Method, Secant Method, Newton-Raphson Method, Successive Approximation Method, Discussion of Convergence, Interpolation and Extrapolation, Calculus of difference, Newton’s Forward Interpolation Formula and Backward Interpolation Formula, Lagrange’s method, Newton’s divided difference formula, Inverse Interpolation and its applications.  **Numerical differentiation and integration:** Differentiation formulae based on polynomial fit, trapezoidal, Simpson’s and Gaussian quadrature formulae. | | **[16]** |
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| **Module 4:**  **Solution of simultaneous linear equations and ordinary differential equations:** Gauss elimination method, pivoting, ill conditioned equations, Gauss Seidel and Gauss Jacobi iterative methods, Taylor series and Euler methods, Modified Euler method, error analysis, Runge-Kutta method. | | **[10]** |
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| **Text Books:** | |
| 1 | S.C. Gupta and V K Kapoor; Fundamentals of Mathematical Statistics, S Chand & Sons |
| 2 | [T. Veerarajan](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22T.+Veerarajan%22), T Ramachandran; Numerical Methods. |
| **Reference Books:** | |
| 1 | Manish Goyal; Numerical methods and Statistical Techniques using ‘C’, Laxmi Publications pvt. Ltd. |
| 2 | S Dey and S Gupta; Numerical Methods ,Tata McGraw-Hill Education, 2013 |
| 3 | B.S. Grewal; [Numerical methods in engineering and science](http://everybodylovesfreeware.blogspot.com/2014/12/numerical-methods-in-engineering-and.html), 42 Edition*,* Khanna Publishers. |

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| **Numerical and Statistical Lab** | **SMA51241** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| This will be based on the topics covered in the course **SMA51141**, which emphasis to write the programs for Statistical and Numerical Methods using C/ MATLAB 7.5. |

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| **Computer Programming** | **ECS51101** | **3-0-0** | **3 Credits** |

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| **Module 1:**  **Fundamentals Of Computer:** History Of Computer, Generation Of Computer, Classification Of Computer, Basic Architecture Of Computer, Memory, Input And Output Devices, Binary And Other Number System, BCD, ASCII, Binary Arithmetic And Logic Gates, Algorithm And Flowchart. | | **[5]** |
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| **Module 2:**  **Basics Of C Programming:** Characters, Identifiers, Keywords, Data Type And Sizes, Constant And Variables, Various Operators And Expressions, Standard Input And Output, Formatted Input And Output Printf(), Flow Of Control And Exit() Function. | | **[10]** |
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| **Module 3:**  **Functions And Pointers:**Definition, Declaration Of Function, Various Types Of Functions, Call-By-Value, Call-By-Reference, Recursion, Tail Recursion, Pointer, Functions With Pointer. | | **[10]** |
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| **Module 4:**  **Arrays:** Definition, Declaration, Initialization Of An Array, Dimensionality, Sorting And Searching Algorithms  **String:** Definition, Declaration, Initialization, String Functions. | | **[8]** |
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| **Module 5:**  **Structures:**Definition, Declaration, Initialization, Operators Used In Structure, Structure Within Structures,  **Unions:**Union, Difference Between A Structure And An Union. | | **[8]** |
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| **Module 6:**  **Files:** Types Of File, File Processing, Handling Characters, Handling Integers, Random File Accessing, Errors During File Processing. | | **[4]** |
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| **Text Books:** | |
| 1 | “The Complete Reference”, 4th Edition By Herbert Schildt, Tata Mcgraw Hill Education |
| **Reference Books:** | |
| 1 | “The C Programming Language”, 2nd Edition, Brian W. Kernighan, Dennis M. Ritchie, PHI |
| 2 | “Schaum's Outline Of Programming With C”, 2nd Edition, Byron S. Gottfried, Mcgraw Hill Education |

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| **Computer Programming Lab** | **ECS51201** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| Programs to demonstrate Decision making, Branching and Looping, use of break and continue etc. Implementation involving the use of Arrays with subscript, String operations and pointers,  Implementation involving the use Functions and Recursion.  Implementation involving the use Structures and Files.  Implementation based on stack Queues and link list for example insertion and deletion. |

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| **Computer Organization & Architecture** | **ECS51103** | **3-0-0** | **3 Credits** |

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| **Module 1**  **Basic Functional Blocks Of A Computer:** CPU, Memory, Input-Output Subsystems, Control Unit. Instruction Set Architecture Of A CPU – Registers, Instruction Execution Cycle, RTL Interpretation Of Instructions, Addressing Modes, Instruction Set. Case Study – Some Common Instruction Sets.  **Data Representation:** Signed Number, Fixed, Floating Point And Character Representation. Computer Arithmetic. Multiplication – Shift-And-Add, Booth Multiplier, Carry Save Multiplier, Etc. Division: Restoring And Non-Restoring Techniques, Floating Point Arithmetic. | | **[11]** |
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| **Module 2:**  **Introduction** To X86 Architecture.  **CPU Control Unit Design:** Hardwired And Micro-Programmed Design Approaches, Case Study –Simple Hypothetical CPU Design.  **Memory System Design:** Semiconductor Technologies in Memory Design and it’s Organization.  **Peripheral Devices And Their Characteristics:** Input-Output Subsystems, I/O Device Interface, I/O Transfers – Program Controlled, Interrupt Driven And DMA, Privileged And Non-Privileged Instructions, Software Interrupts And Exceptions. Programs And Processes – Role Of Interrupts In Process State Transitions, I/O Device Interfaces – SCII, USB | | **[12]** |
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| **Module 3:**  **Pipelining:** Basic Concepts Of Pipelining, Throughput And Speedup, Pipeline Hazards.  **Parallel Processors:** Introduction To Parallel Processors, Concurrent Access To Memory And Cache Coherency. | | **[11]** |
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| **Module 4:**  **Memory Organization:** Memory Interleaving, Concept Of Hierarchical Memory Organization, Cache Memory, Cache Size Vs. Block Size, Mapping Functions, Replacement Algorithms, Write Policies. | | **[11]** |
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| **Text Books:** | |
| 1 | “Computer Organization And Design: The Hardware/Software Interface”, 5th Edition By David A. Patterson And John L. Hennessy, Elsevier. |
| 2 | “Computer Organization And Embedded Systems”, 6th Edition By Carlhamacher, Mcgraw Hill Higher Education. |
| **Reference Books:** | |
| 1 | “Computer Architecture And Organization”, 3rd Edition By John P. Hayes, WCB/Mcgraw-Hill |
| 2 | “Computer Organization And Architecture: Designing For Performance”, 10th Edition By William Stallings, Pearson Education. |
| 3 | “Computer System Design And Architecture”, 2nd Edition By Vincent P. Heuring And Harry F. Jordan, Pearson Education |

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| **Fundamentals of Computer Algorithms** | **ECS51105** | **3-0-0** | **3 Credits** |

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| **Module 1**  **Introduction:** Basic Terminology: Elementary Data Structures and Operations, Abstract Data Types, Analysis Of Algorithms, Time-Space Trade-Off.  **Arrays:** Array Definition And Analysis, Representation In Memory, Traversal, Insertion And Deletion in Array, Single Dimensional Arrays.  **Searching Algorithms:** Linear Search And Binary Search Techniques. | | **[11]** |
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| **Module 2:**  **Stacks And Queues:** ADT Stack, it’s Operations and Applications, ADT Queue, its Operations, Linear Queue, Circular Queue, Priority Queue, Queues Using Array, Applications Of Queues. | | **[11]** |
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| **Module 3:**  **Linked Lists:** Singly Linked Lists: Traversing, Searching, Insertion, Deletion, Linked Stacks And Queues. Polynomial Addition, Header Nodes, Doubly Linked List. Circular Linked Lists.  **Trees:** Tree Related Algorithms, ADT Binary Tree, Binary Tree Implementations, Binary Tree Traversals, Threaded Binary Tree, Binary Search Tree, AVL Tree, Suitable Applications Of Binary Trees, B Tree, B+ Tree. | | **[12]** |
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| **Module 4:**  **Sorting Algorithms**: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Performance And Comparison Of Sorting Techniques, Hashing.  **Graph:** Terminology And Representations, Graph Search And Traversal Algorithms. | | **[11]** |
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| **Text Books:** | |
| 1 | “Fundamentals Of Data Structures”, Illustrated Edition By Ellis Horowitz, Sartajsahni,Computer Science Press. |
| **Reference Books:** | |
| 1 | “Algorithms, Data Structures, And Problem Solving With C++”, Illustrated Edition By Mark Allen Weiss, Addison-Wesley Publishing Company |
| 2 | “How To Solve It By Computer”, 2nd Impression By R. G. Dromey, Pearson Education |

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| **Data Structures** | **ECS51107** | **3-1-0** | **4 Credits** |

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| **Module 1**  **Introduction:** Basic Terminology, Elementary Data Organization, Algorithm, Efficiency Of An Algorithm, Time And Space Complexity, Asymptotic Notations, Time-Space Trade-Off, Abstract Data Type (ADT). | | **[6]** |
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| **Module 2:**  **Array:** Definition, 1D And Multi-Dimensional Arrays, Representation Of Arrays, Row Major And Column Major Order, Applications, Sparse Matrices And Their Representation.  **Stacks And Queues:** ADT Stack, Array Implementation Of Multiple Stack, Application Of Stacks: Conversion From Infix To Postfix, Evaluation Of Postfix And Prefix Notation Etc. ADT Queue, Linear Queue, Circular Queue. | | **[8]** |
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| **Module 3:**  **Linked List:** Static And Dynamic Implementation Of Singly Linked List, Doubly Linked List, Circular Linked List, And Linked List Operations. Insertion, Deletion, Traversal, Polynomial Representation And Addition, Generalized Linked List.  **Trees:** Basic Terminology, Binary Trees, and their Representation: Static And Dynamic, Complete And Extended Binary Trees, Algebraic Expressions, Array And Linked Representation, Tree Traversal Algorithms, Threaded Binary Trees, Traversing Of Threaded Binary Trees, Huffman Algorithm. | | **[9]** |
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| **Module 4:**  **Graphs:** Terminology, Sequential And Linked Representation Of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi-List, Graph Traversal: Depth First Search And Breath First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims And Kruskal Algorithm. Transitive Closure And Shortest Path Algorithms: Warshal Algorithm And Dijkstra Algorithm, Introduction Of Activity Networks. | | **[10]** |
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| **Module 5:**  **Searching And Sorting:** SequentialSearch, Binary Search, Comparison AndAnalysis Of Internal Sorting: Insertion Sort, Selection Sort, Bubble Sort, Quick Sort, Two-Way Merge Sort, Heap Sort, Radix Sort. Search Trees: Binary Search Trees (BST), Insertion And Deletion, Complexity, AVL Trees. M-Way Search Trees, B-Trees And B+ Trees. Hashing. | | **[12]** |
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| **Text Books:** | |
| 1 | “Data Structures Using C”, 7thEdition, A. M. Tenenbaum, Yedidyah Langsam And Moshe J. Augenstein, PHI Learning Private Limited, Delhi, India. |
| 2 | “Data Structures And Algorithms In C++”, 2ndEdition, M. T. Goodrich, Roberto Tamassia, David M. Mount, John Wiley & Sons. |
| **Reference Books:** | |
| 1 | “Fundamentals Of Data Structures”, Illustrated Edition By Ellis Horowitz, Sartaz Sahani, Computer Science Press. |
| 2 | “Data Structures:Schaum’s Outline Series”, Lischutz, Tata Mcgraw-Hill Education Pvt. Ltd. |

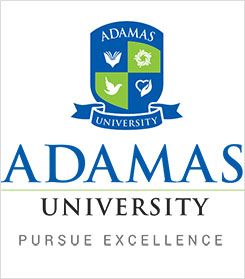
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| **Laboratory:** |
| Implementation of array operations, Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements Merging Problem, Evaluation of expressions operations on multiple stacks & queues: Implementation of linked lists: inserting, deleting, and inverting a linked list. Implementation of stacks & queues using linked lists, Polynomial addition, Polynomial multiplication, Sparse Matrices: Multiplication, addition. Recursive and No recursive traversal of Trees, Threaded binary tree traversal. AVL tree implementation Application of Trees. Application of sorting and searching algorithms, Hash table implementation: searching, inserting and deleting, searching & sorting techniques. |

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| **Data Structures Lab** | **ECS51207** | **0-0-3** | **2 Credits** |

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| **HSS-I** | **HEN41117** | **3-0-0** | **3 Credits** |

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| **Unit-I: Oral Skill I**  Interactions in different situations- Formal dialogues- Group interactions | | **[6]** |
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| **Unit-II: Oral Skill II**  Inviting people to a programme- Apologizing and responding to apologies- Congratulations and Response-Showing appreciation- Expressing sympathy, regret or Consolation-Asking for, granting and refusing permission | | **[9]** |
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| **Unit-III: Oral Skill III**  Debates and Extempore | | **[9]** |
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| **Unit-IV: Reading Skill**  Newspaper Reading and Interpretation | | **[5]** |
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| **Unit-V (Writing Skill I)**  Importance of writing skills – Effective means of written communication –Report Writing – Memo writing – Summary writing | | **[11]** |
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| **Unit-VI (Writing Skill II)**  Article, Paragraph, Applications, Emails and Drafts | | **[5]** |
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| **Text Books:** | |
| 1 | *Spoken and Written Communication*. Board of Editors. Orient Blackswan. |
| 2 | M. S Gupta. *Current English Grammar and Usage*. Prentice Hall India Learning Private Limited; 2016. |
| 3 | P. C. Das. *Spoken English and Functional Grammar*. |



**ADAMAS UNIVERSITY**

**Master of Computer Application (MCA)**

**SEMESTER II**

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| **Discrete Mathematics** | **SMA51142** | **3-1-0** | **4 Credits** |

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| **Module 1:**  **Sets, Relation and Function:** Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.  **Principles of Mathematical Induction:** The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, the Fundamental Theorem of Arithmetic. | | **[16]** |
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| **Module 2:**  **Introduction to Counting:** Basic Counting Techniques, Inclusion, Exclusion, Pigeon-Hole Principle, Permutation and Combination, Summation.  **Recurrence Relation and Generating Function:**Recurrence Relation, The First-Order Linear Recurrence Relation, The Second-Order Linear Homogeneous Recurrence Relation with Constant Coefficients, The Nonhomogeneous Recurrence Relation, The Method of Generating Function, Divide-and Conquer Algorithms, Generating Function, an Introductory Example, calculation Techniques, Partitions of Integers, the Exponential Generating Function, and the Summation Operator. | | **[14]** |
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| **Module 3:**  **Algebraic Structures and Morphism:** Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields, Boolean Algebra, Boolean Expression and Boolean Function, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Sum-of-Product, Functional Completeness, Switching Function: Disjunctive and Conjunctive Normal Form, Logic Gates, Minimization of Circuits, Boolean Ring. | | **[16]** |
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| **Module 4:**  **Introduction to Graphs:** Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph  **Trees:** Definition Properties and Example, Rooted Trees, Trees and Sorting, Weighted Trees and Prefix Codes, Bi-connected Component and Articulation Points, Shortest Distances. | | **[14]** |
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| **Text Books:** | |
| 1 | Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw - Hill. |
| 2 | C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill. |
| **Reference Books:** | |
| 1 | Schaum’s Outlines Series, Seymour Lipschutz, Marc Lipson, Discrete Mathematics, Tata McGraw - Hill. |
| 2 | Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press. |

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| **Design And Analysis of Algorithms** | **ECS51102** | **3-0-0** | **3 Credits** |

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| **Module 1:**  **Introduction:** Fundamentals. Asymptotic Analysis Of Complexity – Best, Average And Worst-Case. Empirical Measurements Of Performance, Time And Space Trade-Offs In Algorithms. Recurrence Relations For Recursive Algorithms. | | **[9]** |
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| **Module 2:**  **Fundamental Algorithmic Strategies:** Illustrations Of Brute-Force, Greedy, Branch-And-Bound, Backtracking And Dynamic Programming Methodologies. Heuristics – Characteristics And Their Applicability. Algorithms For String/Text Matching Problems, Huffman Code And Data Compression Problems, Subset-Sum And Knapsack Problems. | | **[12]** |
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| **Module 3:**  Graph And Tree Algorithms: Depth- And Breadth- First Traversals. Shortest Path Algorithms, Transitive Closure, Minimum Spanning Tree, Topological Sort, Network Flow Problems. | | **[12]** |
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| **Module 4:**  **Tractable And Intractable Problems:** Computability. The Halting Problem. Computability Classes – P, NP, NP-Complete And NP-Hard. Cook’s Theorem. Standard NP-Complete Problems And Reduction Techniques. | | **[6]** |
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| **Module 5:**  **Advanced Topics:** Approximation Algorithms, Randomized Algorithms, Class Of Problems Beyond NP – PSPACE. | | **[6]** |
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| **Text Books:** | |
| 1 | Introduction To Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest And Clifford Stein, MIT Press/Mcgraw-Hill. |
| 2 | Fundamentals Of Algorithms – E. Horowitz Et Al. |
| **Reference Books:** | |
| 1 | Algorithm Design, 1ST Edition, Jon Kleinberg And Évatardos, Pearson. |
| 2 | Algorithm Design: Foundations, Analysis, And Internet Examples,Second Edition,Michael T Goodrich And Roberto Tamassia, Wiley. |
| 3 | Algorithms -- A Creative Approach, 3RD Edition, Udimanber, Addison-Wesley, Reading, MA. |

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| **Design And Analysis of Algorithms Lab** | **ECS51202** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| 1. Implementation based on Divide and Conquer: Binary Search using Divide and Conquer approach, Quick sort and Merge Sort 2. Implementation based onDynamic Programming : Implement all pair of Shortest path for a graph ( Floyed- Warshall Algorithm ), Dijkstra , Bellman Ford Algorithm and Implement Traveling Salesman Problem 3. Implementation based onBrunch and Bound :Implement 15 Puzzle Problem 4. Implementation based onBacktracking :Implement 8 Queen problem, Graph Coloring Problem, Hamiltonian Problem 5. Implementation based onGreedy method**:** Knapsack Problem and Job sequencing with deadlines, Minimum Cost Spanning Tree by Prim's Algorithm and Minimum Cost Spanning Tree by Kruskal's Algorithm 6. Implementation based onGraph Traversal Algorithm **:** Implement Breadth First Search (BFS) and Implement Depth First Search (DFS) |

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| **Object Oriented Programming** | **ECS51104** | **3-0-0** | **3 Credits** |

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| **Module 1**  **OOP Concepts -** Data Abstraction, Encapsulation, Inheritance, Benefits Of Inheritance, Polymorphism, Classes And Objects, Procedural And OOP Paradigms.Introduction To Java, Data Types, Variables&Constants, Scope & Life Time Of Variables, Precedence Of Operator, Expressions, Type Casting, Enumerated Types,Block Scope, Control Flow, Conditional Statements, Loops, Break & Continue Statements, Arrays, Console Input/Output, Formatting Output, ConstructorsMethods, Parameter Passing, Static Fields & Methods, Access Control, “This” Reference, Method Overloading, Recursion, Garbage Collection, Building Strings, String Class. | | **[9]** |
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| **Module 2:**  **Inheritance -** Hierarchical Inheritance: Super And Sub Classes, Member Accessing Rules, Super Keyword, And Preventing Inheritance: Final Classes And Methods, Object Class And Its Methods.  **Polymorphism -** Dynamic Binding, Method Overriding, Abstract Classes And Methods  **Interfaces -** Interfaces And Abstract Classes, Definition, Implementation, Accessing Implementations By Interface References, Extending Interfaces.  **Inner Classes -** Usage, Local, Anonymous And Static Inner Classes, Examples.  **Packages -** Definition, Creation And Accessing A Package, Understanding CLASSPATH, Importing Packages. | | **[9]** |
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| **Module 3:**  **Exception Handling -** Dealing With Errors, Advantages Of Exception Handling, The Classification - Exception Hierarchy, Checked And Unchecked Exceptions, Try, Catch, Throw, Throws And Finally, ExceptionsRe-Throwing, Exception Specification, Built In Exceptions, Creating Exception Sub Classes.  **Multithreading -** Difference Between Multiple Processes And Multiple Threads, Thread States, Creating And Interrupting Threads, Thread Priorities, Synchronizing Threads, Inter-Thread Communication, Procedure Consumer Pattern. | | **[9]** |
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| **Module 4:**  **Collection Framework -** Introduction, Generics and Common Use Of Collection Classes, Array List, Vector, Hash Table, Stack, Enumeration, Iterator, String Tokenizer, Random, Scanner, Calendars And Properties.  **Files -** Streams - Byte Streams, Character Streams, Text Input/Output, Binary Input/Output, Random Access Of File Operations, File Management.  **Connecting To Database –** JDBC / ODBC Type 1 To 4 Drivers, Connection And Handling Databases With JDBC. | | **[9]** |
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| **Module 5:**  **GUI Programming -**The AWT Class Hierarchy, Introduction To Swing, Swing Vs, AWT, Hierarchy Of Swing Components, Containers - Jframe, Japplet, Jdialog, Jpanel, Overview Of Swing Components: Jbutton, Jlabel, Jtextfield, Jtextarea, Swing Applications, Layout Management - Types - Border, Grid And Flow  **Event Handling -** Events, Sources, Classes, Listeners, Event Sources And Listeners, Delegation Event Model, Examples.Handling Mouse Events, Adapter Classes.  **Applets -** Inheritance Hierarchy For Applets, Differences Between Applets And Applications, Life Cycle, Passing Parameters To Applets, Applet Security Issues. | | **[9]** |

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| **Text Books:** | |
| 1 | “Java Fundamentals - A Comprehensive Introduction”, Illustrated Edition By Daleskrien, Herbert Schildt, Mcgraw-Hill Education. |
| **Reference Books:** | |
| 1 | “Java For Programmers”, 2nd Edition By Paul Deitel And Harvey Deitel, Pearson Education. |
| 2 | “Thinking In Java”, Low Price Edition By Bruce Eckel, Pearson Education |

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| **Laboratory:** |
| Programs to demonstrate class and constructor.  Programs to demonstrate overloading.  Programs to demonstrate inheritance, overriding.  Programs to demonstrate wrapper class, arrays.  Programs to demonstrate developing interfaces- multiple inheritances, extending interfaces  Programs to demonstrate creating and accessing packages  Programs to demonstrate multithreaded programming  Programs to demonstrate applet programming |

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| **Object Oriented Programming Lab** | **ECS51204** | **0-0-3** | **3 Credits** |

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| **Operating System** | **ECS51106** | **3-0-0** | **3 Credits** |

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| **Module 1:**  **Introduction:** Basics: Definition, Generations, Types, OS Services, System Calls, OS Structure: Layered, Monolithic, Microkernel –Virtual Machine. UNIX And WINDOWS Case Study. | | **[9]** |
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| **Module 2:**  **Processes:** Definition, Process Relationship, Process States, , Process Control Block,Context Switching – Threads –Multithreads, Types And Benefits Of Threads  **Process Scheduling**: Definition, Objectives ,Types Of Schedulers ,Scheduling Criteria : CPU Utilization, Throughput, Turnaround Time, Waiting Time, Response Time (Definition Only) , Pre-Emptive And Non Pre-Emptive Scheduling, FCFS – SJF – RR , Multiprocessor Scheduling : Types , Performance Evaluation Of The Scheduling. | | **[9]** |
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| **Module 3:**  **Inter-Process Communication:** Race Conditions, Critical Section, Mutual Exclusion, Hardware Solution, Strict Alternation , Peterson’s Solution, The Producer Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader’s & Writer Problem, Dinning Philosopher Problem Etc. | | **[6]** |
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| **Module 4:**  **Deadlocks:** Definition, Characteristics, Prevention, And Avoidance:Banker’s Algorithm, Detection And Recovery. | | **[6]** |
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| **Module 5:**  **Basic Memory Management:** Definition,Logical And Physical Address Map; Memory Allocation: Contiguous Memory Allocation – Fixed And Variable Partition – Internal And External Fragmentation,Compaction, Paging: – Hardware Support,Protection And Sharing – Disadvantages.  **Virtual Memory:** Basics – Hardware And Control Structures – Locality Of Reference, Page Fault , Working Set , Dirty Page/Dirty Bit – Demand Paging – Page Replacement Policies : Optimal (OPT) , First In First Out (FIFO), Second Chance (SC), Not Recently Used (NRU) And Least Recently Used (LRU) | | **[9]** |
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| **Module 6:**  **Principles Of I/O Hardware:** I/O Devices, Device Controllers, Direct Memory Access.  **Principles Of I/O Software:** Interrupt Handlers, Device Drivers, Device Independent I/O Software, Secondary-Storage Structure: Disk Structure,Disk Scheduling Algorithm  **File Management:**File Concept, Access Methods, File Types, File Operation, Directory Structure, File System Structure, Allocation Methods (Contiguous, Linked, Indexed), Free-Space Management (Bit Vector, Linked List, Grouping), Directory Implementation (Linear List, Hash Table),Efficiency & Performance.  **Disk Management:**Disk Structure, Disk Scheduling (FCFS, SSTF, SCAN,C-SCAN) , Disk Reliability, Disk Formatting, Bootblock, Badblocks. | | **[6]** |

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| **Text Books:** | |
| 1 | Operating System Concepts Essentials, 9th Edition By Avisilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition. |
| 2 | Operating Systems: Internals And Design Principles, 5th Edition, William Stallings, Prentice Hall Of India. |
| **Reference Books:** | |
| 1 | Operating System: A Design-Oriented Approach, 1st Edition By Charles Crowley, Irwin Publishing. |
| 2 | Operating Systems: A Modern Perspective, 2nd Edition By Gary J. Nutt, Addison-Wesley. |
| 3 | Design Of The Unix Operating Systems, 8th Edition By Maurice Bach, Prentice-Hall Of India. |
| 4 | Understanding The Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly And Associates. |

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| **Laboratory:** |
| Basic Commands in **LINUX.**  **Shell programming:** creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands).  **Process:** starting new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.  **Signal:** signal handling, sending signals, signal interface, signal sets.  **Semaphore:** programming with semaphores (use functions semctl, semget, semop, set\_semvalue, del\_semvalue, semaphore\_p, semaphore\_v)  **Inter-process communication:** pipes (use functions pipe, popen, pclose), named pipes (FIFOs, accessing FIFO) |

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| **Operating System Lab** | **ECS51206** | **0-0-3** | **2 Credits** |

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| **Database Management System** | **ECS51108** | **3-0-0** | **3 Credits** |

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| **Module 1**  **Database System Architecture:** Data Abstraction, Data Independence, DDL And DML.  **Data Models:** Entity-Relationship, Network, Relational And Object Oriented Data Models, Integrity Constraints And Data Manipulation Operations. | | **[8]** |
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| **Module 2:**  **Relational Query Languages:** Relational Algebra, Tuple And Domain Relational Calculus, SQL3, DDL And DML Constructs, Open Source And Commercial DBMS: MYSQL, ORACLE, DB2, SQL Server.  **Relational Database Design:** Domain And Data Dependency, Armstrong's Axioms, Normal Forms, Dependency Preservation, Lossless Design.  **Query Processing And Query Optimization:** Relational Algebra ExpressionsEvaluation, Query Equivalence, Joins Strategies, Query Optimization Algorithms. | | **[12]** |
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| **Module 3:**  **Storage Strategies:**Indices, B-Trees, Hashing. | | **[8]** |
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| **Module 4:**  **Transaction Processing:**Concurrency Control, ACID Property And Serializability Of Scheduling, Locking And Timestamp Based Schedulers, Multi-Version And Optimistic Concurrency Control Schemes, Database Recovery. | | **[8]** |
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| **Module 5:**  **Database Security:** Authentication, Authorization And Access Control, DAC, MAC And RBAC Models, Intrusion Detection, SQL Injection. | | **[5]** |
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| **Module 6:**  **Advanced Topics:** OO Model, Object Relational, Logical, Web, And Distributed Databases, Data Warehousing And Data Mining. | | **[4]** |
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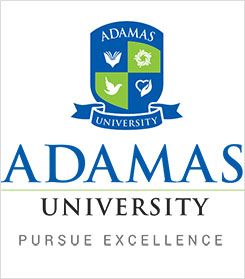
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| **Text Books:** | |
| 1 | “Database System Concepts”, 6th Edition By Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Mcgraw-Hill |
| **Reference Books:** | |
| 1 | “Principles Of Database And Knowledge – Base Systems”, Vol 1 By J. D. Ullman, Computer Science Press. |
| 2 | “Fundamentals Of Database Systems”, 5th Edition By R. Elmasri And S. Navathe, Pearson Education |
| 3 | “Foundations Of Databases”, Reprint By Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley |

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| **Laboratory:** |
| Familiarization of structured query language, Database Schema Design, Database Creation, SQL Programming and Report Generation. Students are to be exposed to front end development tools, ODBC and CORBA calls from application Programs, internet based access to databases and database administration. |

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| **Database Management System Lab** | **ECS51208** | **3-0-0** | **2 Credits** |

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| **HSS-II** | **HEN41119** | **3-0-0** | **3 Credits** |

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| **Module 1**: An attempt to define and identify the contours of Ethics and its relation with Religion, Aesthetics and Professional Education Human Values including basic five human values (against Satya (Truth), Dharam (Righteous conduct), Prem (Love), Shanti (Peace), Ahinsa (Non-violence), Ethics & Morality in Law, General-Lectures by distinguished persons on this subject on regular basis.  Fundamental Duties of citizen. Basic values of the Constitution: Democracy, Republicanism, Rule of law, Constitutionalism and Respect for Minority Rights. | | **[8]** |
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| **Module 2: Human Rights** – Jurisprudence of human rights nature and definition, Universal protection of human rights, Regional protection of human rights, National level protection of human rights, Human Rights and vulnerable groups. | | **[8]** |
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| **Module 3**: **Theory and Nature of Political Institutions**  Concept of State / Nation  Organs of Government – Legislative, Executive and Judiciary  Separation of Powers – Parliamentary Sovereignty and Judicial Independence  Constitutional Framework of India. | | **[8]** |
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| **Module 4: Nature and Sources of Law**  Legislation – Process, delegated and subordinate legislation  Case law- Stare decises, precedents within the hierarchy of courts  Authoritative Sources, Custom, Law reform | | **[8]** |
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| **Module 5: Historical Evolution of Indian Legal System**  Ancient Indian Law, English Law in India  Administration of Justice in British India  Charter of 1861 and subsequent Charters  Establishment of High Courts and the Federal Courts  Drafting of the Indian Constitution  Ancient Indian Law in Modern Legal Framework | | **[5]** |
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| **Module 6: Civil and Criminal Courts And Process**  The Civil Court Structure, The Criminal Court Structure  The Civil Process, The Criminal process- Investigation and Prosecution | | **[4]** |
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| **Module 7: Miscellaneous Laws**  Growing importance of intellectual property rights and related laws in India  Industrial relations laws  An overview of the Law of Contract  Human resource and related laws | | **[4]** |
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**ADAMAS UNIVERSITY**

**Master of Computer Application (MCA)**

**SEMESTER – III**

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| **Data Communication & Computer Network** | **EEC52101** | **3-1-0** | **3 Credits** |

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| **Module 1:**  **Data Transmission Basic Concepts and Terminology:**  Data Communication Model, Communication Tasks, Parallel & Serial Transmission, Transmission Models, Transmission Channel, Data Rate, Bandwidth Signal Encoding Schemes, Data Compression. | | | | | **[3]** |
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| **Module 2:** **Computer network**  Network Topology, Network Classification, advantages & disadvantages of Network, Transmission Media (guided and unguided), Network Architecture, OSI Reference Model, and TCP/IP. | | | | | **[6]** |
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| **Module 3: Physical Layer:**  Guided Transmission, Media, Wireless Transmission Medium, Circuit Switching and Telephone Network, High Speed Digital Access. | | | | | **[4]** |
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| **Module 4:**  **Data Link Layer:**  Stop and Wait Protocols: Noise free and Noisy channels, performance and efficiency, Sliding Window  Protocols: Go Back and Selective Repeat ARQS, performance and efficiency, verification of protocol. HDLC data link protocol. | | | | | **[6]** |
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| **Module 5:**  **Network and Transport Layer:**  Network Layer: Network Layer Design Issues, Routing Algorithms (Optimality principle, Static Routing Algorithms, Shortest Path, Flooding, Dynamic routing Algorithms, Distance Vector, Link State routing.), Congestion control Algorithms (Principles, Policies, Algorithms), Network Layer Protocols (IP Addressing, IP layer protocols: ICMP, ARP, RARP, DHCP, BOOTP, IPv6)  Transport Layer: Transport Layer Service, Elements of Transport protocols, Internet protocols (UDP and TCP) | | | | | **[8]** |
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| **Module 6:**  **Application Layer:**  DNS, Electronic Mail, The World Wide Web (Architectural Overview only), Multimedia. | | | | **[3]** | |
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| **Module 7:**  **Local Area Network & Medium Access Layer:**  LAN topologies, Layered architecture of LAN, MAC, IEEE standard. Ethernet LAN, Multiple Access: CSMA, CSMA/ CD CSMA/CA. | | | | | **[4]** |
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| **Module 8:**  **Network Security:**  Introduction to Cryptography, Data Encryption standard, RSA Algorithm, Digital signature, Public keys, IPSec, Firewalls. | | | | | **[6]** |
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| **Module 9:**  **Advance Networks:**  Introduction to Mobile Communication and Networks - their types and basic principles; ISDN and B-ISDN; ATM- Header structure, Protocol stack, Signaling and Service category, Virtual Private Networks (VPN), MPLS support for VPN | | | | | **[5]** |

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| **Text Books:** | |
|  | **1.** B A. Forouzan, “Data Communication and Networking”, 4/e, McGraw Hill, 2006. |
|  | **2**. W Stallings, “Data and Computer Communication” –7/e Pearson |
| **Reference Books:** | |
|  | **1.** A Tanenbarum, “Computer Networks” –4th Edition, PHI, 2004/Pearson Education 4th Edition. |
|  | **2.**  Leon-Garcia and Widjaja, “Communication Networks”, 2/e McGraw Hill, 2004 |
|  | **3.** ISRD “Data Communication and Computer Networks” McGraw Hill, 2006 |

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| **Accounting & Management** | **MBA52155** | **3-0-0** | **3 Credits** |

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| **Module 1:** Preparation of Final Accounts of Sole Proprietorship Business Entities; Financial Statements of not-for-profit Organisation, Bills of Exchange and Promissory Notes; Average Due Date and Account Current. | | **[8]** |
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| **Module 2:**  PARTNERSHIP- Accounting of Partnership Firms—Fundamentals; Reconstitution of Partnership—(i) Change in Profit Sharing Ratio (ii) Admission of a Partner (iii) Retirement / Death of a Partner; Treatment of Goodwill in Partnership Account. | | **[15]** |
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| **Module 3:**  **Basic concepts of management:** Definition – Need and Scope – Different schools of management thought – Classical, Behavioural, Scientific, Systems, and Contingency etc, Tasks of a Professional Manager - Social Responsibilities of Business. Levels in Management – Managerial Skills. | | **[10]** |
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| **Module 4:**  Japanese Management Practices – Organizational Creativity and Innovation – Management of Innovation – Entrepreneurial Management – Benchmarking – Best Management Practices across the world . Management of Diversity. | | **[6]** |

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| **Text Books:** | |
| 1 | “ Lallan Prasad/S S Gulshan, Management - Principles and Practices, Excel Books, 2nd edition.. |
| 2 | “Discrete Mathematical Structures With Applications To Computer Science”, J. P. Trembley And R. Manohar, Mcgraw Hill Book Co. |
| **Reference Books:** | |
| 1 | MHanif& A Mukherjee-Financial Accounting (2nd Edn): McGraw Hill Education, New Delhi,2015 |
| 2 | Dr. S. N. Maheshwari, Basic Financial Management,**Vikas Publishing House Pvt. Ltd** |

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| **Formal Language and Automata Theory** | **ECS52101** | **3-1-0** | **4 Credits** |

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| **Module 1:**  **Review Of Discrete Structures:** Sets, Relations And Functions, Morphisms; Posets And Lattices, Boolean Algebra, Proof Techniques – Inductive And Deductive Reasoning, Proof By Contradiction; Recurrence Relations, Algebraic Structures – Semigroup, Monoid, Group, Ring And Field. Propositional And Predicate Calculus. | | **[14]** |
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| **Module 2:**  **Automata And Languages:**  Strings, Phrase Structured Grammar And Formal Languages -- Finite Automata And Regular Expressions, Closure Properties Of Regular Languages, Pumping Lemma And Non-Regular Languages.  Context Free Languages (CFL) And Pushdown Automata (PDA), Normal Forms Of Cfls, Closure Properties Of Cfls, Pumping Lemma And Non-Context Free Languages, Deterministic Pushdown Automata And Dcfls.  Chomsky Hierarchy Of Grammars And Corresponding Acceptors; Turing Machines, And Type 0 Languages, Recursive And Recursively Enumerable Languages, Turing Computable Functions, Primitive And Mu-Recursive Functions. | | **[20]** |
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| **Module 3:**  **Computability:** Church-Turing Thesis, Decision Problems, Decidability And Undecidability, Universal Turing Machine, Halting Problem Of Turing Machines, Problem Reduction (Turing And Mapping Reduction). | | **[14]** |
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| **Module 4:**  **Computational Complexity:** Time And Space Complexity Measures; Class P And Class NP Problems, NP-Completeness, Time And Space-Bounded Turing Machines, Oracle Machines And The Polynomial Hierarchy, Randomized Computation, Parallel Computation. | | **[12]** |

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| **Text Books:** | |
| 1 | “Introduction To The Theory Of Computation”, 3rd Edition, Michael Sipser, Cengage Learning. |
| 2 | “Discrete Mathematical Structures With Applications To Computer Science”, J. P. Trembley And R. Manohar, Mcgraw Hill Book Co. |
| **Reference Books:** | |
| 1 | “Introduction To Automata Theory, Languages, And Computation”, 3rd Edition, John E. Hopcroft, Rajeev Motwani And Jeffrey D. Ullman, Pearson Education. |
| 2 | “Elements Of The Theory Of Computation”, H. R. Lewis And C. H. Papadimitrou, Prentice Hall, International Inc. |

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| **Software Engineering** | **ECS52103** | **3-0-0** | **3 Credits** |

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| **Module 1:**  **Introduction:** Evolution Of Software – Software – Software A Crisis On The Horizon – Software Myths | | **[6]** |
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| **Module 2:**  **Software Engineering Layered Technology:** Software Process – Software Process Models – The Linear Sequential Model – The Prototyping Model – The RAD Model – Evolutionary Models – Component Based Development – The Formal Methods Model – Fourth Generation Techniques | | **[4]** |
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| **Module 3:**  **Project Management Concepts:** The Management Spectrum, People, The Problem, The Process, The Project, Critical Approach | | **[6]** |
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| **Module 4:**  **Software Process And Project Metrics:** Measures, Metrics, And Indicators, Metrics In The Process And Project Domains , Software Measurement, Reconciling Different Metrics Approaches, Metrics For Software Quality, Managing Validation  **Software Project Planning:** Observations On Estimation - Project Planning Objectives-Resources – Software Project Estimation – Empirical Estimation Models-Automated Estimation Tools, Risk Management – Software Risks – Risk Identification – Risk Projection – Risk Refinement –Safety Risks And Hazard – RMMM Plans | | **[8]** |
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| **Module 5:**  **Project Scheduling And Tracking:** Defining Task Set-Defining Task Network – Scheduling- Earned Value Analysis- Error Tracking-Project Plan.  **Software Quality Assurance:** Quality Concepts, The Quality Movement-Software Quality Assurance, Reviews, Reliability.  S**oftware Configuration Management:** Identification Of Objects In The Software Configuration-Configuration Of Audit-SCM Standards  **Analysis Concepts And Principles:** Requirement Analysis, Software Prototyping-Specification, Analysis Modeling, Data Modeling, Functional Modeling, Behavioral Modeling, Data Dictionary | | **[10]** |
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| **Module 6:**  **Design Concepts And Principles:** Effective Modular Design, Design Heuristics, Design Model, Documentation  **Software Design:** Software Architecture, Data Designing, Architectural Styles, Transform Mapping, Transaction Mapping, Refining Architectural Design, User Interface Design: Component Level Design  **Software Testing Techniques:** White Box And Black Box Testing, Testing For Specialized Environment, Architectures And Applications, Software Testing Strategies: Unit Testing, Integrating Testing, Validation Technique – System Testing, Debugging. | | **[9]** |
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| **Text Books:** | |
| 1 | Software Engineering: A Practitioner's Approach, 8th Edition, Roger S. Pressman, Mcgraw Hill. |
| 2 | An Integrated Approach To Software Engineering, Springer/Narosa Edition, Pankajjalote. |
| **Reference Books:** | |
| 1 | Fundamentals Of Software Engineering, 4th Edition, Rajib Mall, Prentice Hall, India. |
| 2 | Software Engineering, 10th Edition, Ian Sommerville, Addison-Wesley. |

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| **Software Engineering Lab** | **ECS52203** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| Development of requirements specification, function oriented design using SA/SD, object-oriented design using UML, test case design, implementation using Java and testing. Use of appropriate CASE tools and other tools such as configuration management tools, program analysis tools in the software life cycle. |

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| **HSS-III(English Communication)** | **HEN42111** | **3-0-0** | **3 Credits** |

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| **Module 1:**  Introduction to Communication – Communication Model –Types of Communications – Barriers to Communication – Effective means of communication | | **[6]** |
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| **Module 2:**  Reading Skills – Importance of Reading – Types of Reading – Effective reading skills | | **[4]** |
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| **Module 3:**  Listening Skills – Importance of Listening – Types of Listening – Barriers to Listening | | **[6]** |
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| **Module 4:**  Presentation Skills – Different types of Presentation skills – Non verbal Communications –– Use of Visual aids | | **[8]** |
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| **Module 5:**  Group Discussion, Business Dialogues and Interaction | | **[10]** |
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| **Module 6:**  Mock Interviews | | **[11]** |
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| **Text Books:** | |
| 1 | *Business Communication Today.*Bovee, Thill, Schwatzman, Pearson Education. |
| 2 | *Spoken and Written Communication*. Board of Editors. Orient Blackswan |
| 3 | M. S Gupta. *Current English Grammar and Usage*. Prentice Hall India Learning Private Limited; 2016. |
| 4 | P. C. Das. *Spoken English and Functional Grammar*. |
| 5 | Sangeeta Sharma and Binod Mishra. *Communication skills for Engineers and Scientists.* Prentice Hall India Learning Private Limited, 2009. |

**ELECTIVE – I**

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| **Computer Graphics and Visualization** | | **ECS52105** | **3-0-0** | **3 Credits** | |
| **Module 1:**  Primitive Output Design: Algorithms for Line, Circle and Ellipse drawing; Attributes of output primitives: Two dimensional Geometric transformation, 2D viewing: Line, Polygon, Curve and Text clipping algorithms. | | | | | **[8]** | |
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| **Module 2:**  Parallel and Perspective projections, Three dimensional object representation, Polygons, Curved lines, Splines, Quadric Surfaces, Data set visualization, 3D transformations and viewing, Identification of visible surface. | | | | | **[9]** | |
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| **Module 3:**  Different Color Models – RGB, CMY, YIQ, HSV; General Computer Animation, Raster, Key-frame, Graphics programming using OPENGL, Graphics primitives, Drawing three dimensional objects and scenes. | | | | | **[10]** | |
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| **Module 4:**  Fundamentals of Shading model, Flat and Smooth shading, Adding texture on faces, Adding shadow of an object, Building camera in a program, Creating shaded objects, Rendering texture and Drawing Shadows. | | | | | **[8]** | |
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| **Module 5:**  Self similarity and Fractals, Random Fractals, Piano curves, Image creation by iterative functions, Mandelbrot sets, Julia Sets, Overview of Ray Tracing, Ray intersection, Adding Surface texture, Transparency and Reflections, Boolean operations on Objects. | | | | | **[10]** | |
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| **Text Books:** | |
| 1 | Computer Graphics with Open GL, 4th Edition, Donald D. Hearn, M. Pauline Baker, Warren Carithers, Pearson Education |
| 2 | Computer Graphics using OPENGL, Third Edition,F.S. Hill, Pearson Education. |
| **Reference Books:** | |
| 1 | Computer Graphics- Principles and Practice, Third Edition,[John F. Hughes](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22John+F.+Hughes%22), [AndriesHYPERLINK "https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Andries+Van+Dam%22" Van Dam](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Andries+Van+Dam%22), [James D. Foley](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22James+D.+Foley%22), [Steven K. HYPERLINK "https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Steven+K.+Feiner%22"Feiner](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Steven+K.+Feiner%22), Addison-Wesley |

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| **Computer Graphics Lab** | **ECS52205** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| Programming for generating lines, curves and rendered surfaces. Interactive graphics programming: modeling and updating objects in an object hierarchy, video games, computer animation and realistic image synthesis. |

**ELECTIVE – I**

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| **Machine Learning** | | **ECS52107** | **3-0-0** | **3 Credits** | |
| **Module 1:**  **Introduction:** Overview of machine learning, related areas, applications, software tools, course objectives.  **Parametric regression:** linear regression, polynomial regression, locally weighted regression, numerical optimization, gradient descent, kernel methods. | | | | | **[6]** | |
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| **Module 2:**  **Generative learning**: Gaussian parameter estimation, maximum likelihood estimation, MAP estimation, Bayesian estimation, bias and variance of estimators, missing and noisy features, nonparametric density estimation, Gaussian discriminant analysis, naive Bayes. | | | | | **[8]** | |
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| **Module 3:**  **Discriminative learning**: linear discrimination, logistic regression, logit and logistic functions, generalized linear models, softmax regression. **Neural networks**: the perceptron algorithm, multilayer perceptrons, back-propagation, nonlinear regression, multiclass discrimination, training procedures, localized network structure, dimensionality reduction interpretation. | | | | | **[12]** | |
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| **Module 4:**  **Support vector machines**: functional and geometric margins, optimum margin classifier, constrained optimization, Lagrange multipliers, primal/dual problems, KKT conditions, dual of the optimum margin classifier, soft margins, kernels, quadratic programming, SMO algorithm. | | | | | **[7]** | |
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| **Module 5:**  **Graphical and sequential models**: Bayesian networks, conditional independence, Markov random fields, inference in graphical models, belief propagation, Markov models, hidden Markov models, decoding states from observations, learning HMM parameters. | | | | | **[4]** | |
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| **Module 6:**  **Unsupervised learning**: K-means clustering, expectation maximization, Gaussian mixture density estimation, mixture of naive Bayes, model selection. | | | | | **[4]** | |
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| **Module 7:**  **Dimensionality reduction**: feature selection, principal component analysis, linear discriminant analysis, factor analysis, independent component analysis, multidimensional scaling, manifold learning | | | | | **[4]** | |
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| **Text Books:** | |
| 1 | “Elements of Statistical Learning”, T. Hastie, R. Tibshirani and J. Friedman, Springer, 2001. |
| 2 | “Machine Learning”, E. Alpaydin, MIT Press, 2010. |
| **Reference Books:** | |
| 1 | “Pattern Recognition and Machine Learning”, C. Bishop, Springer, 2006. |
| 2 | “Pattern Classification”, R. Duda, E. Hart, and D. Stork, Willey-Interscience, 2000. |

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| **Machine Learning Lab** | **ECS52207** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| 1. Review Basics of Python (3 Hours) 2. Implementation of K-Means clustering using 2-D and higher dimensional dataset. 3. Data Sampling, Visualization, Learning and Classification. 4. Implementation of Regression (Linear and Logistics) 5. Implementation of MCP Neuron using various Boolean logic functions 6. Implementation of Hebb, ADALINE and MADALINE methods of learning using sample dataset. 7. Implementation of Backpropagation of error using smaller dataset (using Gradient Descent). 8. Parameter Estimation    1. Sampling a training and a testing set (from the same underlying distribution).    2. Normalizing training and test data (using parameters estimated on training data!)    3. Estimating classifier parameters on training data (today!)    4. Fitting the classifier on training data.    5. Predicting the class labels of testing data.    6. Evaluating accuracy or classification error. 9. Parameter estimation with xval. 10. Implementation of K-NN, Naïve Bayes Classifier. 11. Implementation of Gaussian Naïve Bayes Classifier. 12. Implementation of Fuzzy C-Means clustering. 13. Reduction of Data Dimension using PCA. 14. Implementation of Linear SVM. 15. Project. |

**ELECTIVE – I**

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| **Pattern Recognition** | | **ECS61105** | **3-0-0** | **3 Credits** | |
| **Module 1**  **Introduction:** Paradigms for pattern recognition, Statistical and Syntactic pattern  Recognition, Soft and Hard computing schemes for pattern recognition. Statistical Pattern Recognition: Patterns and classes, Supervised, Semi-supervised, and Unsupervised classification. | | | | | **[6]** |
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| **Module 2:**  **Representation:** Vector space representation of patterns and classes, patterns and  Classes as strings, Tree-based representations, Frequent item sets for representing classes and clusters, Patterns and classes as logical formulas. | | | | | **[8]** |
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| **Module 3:**  **Proximity Measures:** Dissimilarity measures, metrics, similarity measures, Edit  Distance, Hausdorff metric between point sets, Kernel functions, Contextual and conceptual similarity between points. | | | | | **[8]** |
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| **Module 4:**  **Dimensionality Reduction:** Feature selection: Branch and bound, Sequential feature election, Feature extraction: Fisher's linear discriminant, Principal components as features; Nearest Neighbour Classifiers: Nearest neighbour classifier, Soft nearest neighbour classifiers, Efficient algorithms for nearest neighbour classification, K-Nearest Neighbour classifier, minimal distance classifier, condensed nearest neighbour classifier and its modifications. | | | | | **[10]** |
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| **Module 5:**  **Bayes Classifier:** Bayes classifier, naïve Bayes classifier, Belief net, Decision Trees Axis parallel and oblique decision trees, Learning decision trees, Information gain and Impurity measures.  **Linear Discriminant Functions**: Characterization of the decision boundary,  Weight vector and bias, Learning the discriminant function, Perceptron’s; Support Vector Machines Maximizing the margin, Training support vector machines, Kernel functions. | | | | | **[8]** |
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| **Module 6:**  **Clustering:** Clustering process, Clustering algorithms, and Clustering large datasets.  **Combination of Classifiers:** AdaBoost for classification, Combination of  Homogeneous classifiers, Schemes for combining classifiers. | | | | | **[5]** |
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| **Text Books:** | |
| 1 | “Pattern Recognition: An Introduction”, V. Susheela Devi and M. Narasimha Murty, Universities Press, Hyderabad, 2011. |
| 2 | “Pattern Classification”, R. O. Duda, P. E. Hart and D. G. Stork, John Wiley and Sons, 2000. |
| **Reference Books:** | |
| 1 | “Introduction to statistical pattern recognition”, Academic press, Fukunaga K. 2013. |

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| **Pattern recognition Lab** | **ECS61205** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| |  |  |  | | --- | --- | --- | | **Module 1:**  Implement the concept of object detection , classification using pattern recognition. | | | |  |  | | | **Module 2:**  Implement the concept of regression strategy. | | | |  |  | | | **Module 3:**  Build an OCR model using supervised pattern recognition | | | |  |  | | | **Module 4:**  Build a model to detect faces using pattern recognition. | | | |  | |  | | **Module 5:**  Implement a function for extracting color histogram of an image. | | | |

**ELECTIVE – I**

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| **Logic Programming** | | **ECS61109** | **3-0-0** | **3 Credits** | |
| **Module 1:**  **propositional logic:** syntax and semantics, natural deduction proofs, decision procedures, Horn fragment | | | | | **[10]** |
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| **Module 2:**  **predicate calculus:** syntax and semantics , natural deduction proofs, un-decidability and incompleteness | | | | | **[15]** |
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| **Module 3:**  **Logic Programming:** Horn fragment of predicate logic , unification and top-down operational semantics , use of a logic programming language , Data log and bottom up operational semantics | | | | | **[13]** |
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| **Module 4:**  **Reasoning about sequential programs:** partial correctness assertions, computing weakest preconditions, loop invariants, reasoning about termination | | | | | **[7]** |
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| **Text Books:** | |
| 1 | “Logic in Computer Science: Modelling and Reasoning about Systems”, M.R. Huth and M.D. Ryan, Cambridge University Press 2000. |
| **Reference Books:** | |
| 1 | “Prolog Programming for Artificial Intelligence”, Ivan Bratko, 3rd Edition, Addison-Wesley Publ., 2000. |

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| **Logic programming Lab** | **ECS61209** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| Expt. 1 – Introduction to Prolog – Facts, Variables, Conjunctions, Questions, Rules.  Expt. 2 – Prolog Operators, Equality and Matching, Arithmetic.  Expt. 3 – Representing objects and relations using trees and lists  Expt. 4 – Prolog Programming Techniques  Expt. 5 – Generating a set of solutions. Use of “cut” for modifying control sequence of running  Prolog programs.  Expt. 6 – input-outputting in Prolog; Declaring operators.  Expt. 7 – Introduction to core built-in predicates.  Expt. 8 – Search through a maze.  Expt. 9 – Towers of Hanoi  Expt. 10 – Symbolic Differentiation**.** |

**ELECTIVE – I**

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| **Soft Computing** | | **ECS61111** | **3-0-0** | **3 Credits** | |
| **Module 1:**  **Introduction:** What is soft computing? Differences between soft computing and hard computing, Soft Computing constituents, Methods in soft computing, Applications of Soft Computing. | | | | | **[3]** |
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| **Module 2:**  **Introduction to Genetic Algorithms:** Introduction to Genetic Algorithms (GA), Representation, Operators in GA, Fitness function, population, building block hypothesis and schema theorem.  **Genetic algorithms operators:** Methods of selection, crossover and mutation, Simple GA(SGA), other variant of GA, generation gap, steady state GA, Applications of GA. | | | | | **[12]** |
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| **Module 3:**  **Neural Networks:** Concept, biological neural system, Evolution of neural network, McCulloch-Pitts neuron model, activation functions, feed-forward networks, feedback networks, learning rules – Hebbian, Delta, Perceptron learning and Windrow-Hoff, winner-take-all. | | | | | **[10]** |
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| **Module 4:**  **Supervised learning:** Perceptron learning, single layer and multilayer perceptron, linear reparability, hidden layers, back propagation algorithm, Radial Basis Function network, Unsupervised learning: Kohonen, Self-Organizing Mapping, Counter-propagation, ART, Reinforcement learning, adaptive resonance architecture, applications of neural networks to pattern recognition systems such as character recognition, face recognition, application of neural networks in image processing. | | | | | **[8]** |
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| **Module 5:**  **Fuzzy systems:** Basic definition and terminology, set-theoretic operations, Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions, Fuzzy Rules & Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making; Neuro-fuzzy modeling, Adaptive Neuro-Fuzzy Inference Systems, Coactive Neuro-Fuzzy Modeling, Classification and Regression Trees, Data Clustering Algorithms, Rule-base Structure Identification and Neuro-Fuzzy Control , Applications of neuro-fuzzy modelling. | | | | | **[7]** |
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| **Module 6:**  **Swarm Intelligence:** What is swarm intelligence? Various animal behaviour which have been used as examples, ant colony optimization, swarm intelligence in bees, flocks of birds, shoals of fish, ant based routing, particle swarm optimization | | | | | **[5]** |
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| **Text Books:** | |
| 1 | “Principle of soft computing”, S.N. Shivanandam, Wiley. ISBN13: 9788126527410, 2011. |
| 2 | “Neuro-Fuzzy and Soft Computing”, Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, Prentice Hall of India, 2003. |
| 3 | “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, George J. Klir and Bo Yuan, Prentice Hall, 1995. |
| **Reference Books:** | |
| 1 | “Neural Networks Algorithms, Applications, and Programming Techniques”, James A. Freeman and David M. Skapura, Pearson Education, 2003. |
| 2 | “Genetic Algorithms in Search, Optimization & Machine Learning”, David E. Goldberg, Addison Wesley, 1997. |
| 3 | “An Introduction to Genetic Algorithm”, Mitchell Melanie, Prentice Hall, 1998. |

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| **Soft Computing Lab** | **ECS61211** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| Implementation of Fuzzy Operations. |
| Implementation of Fuzzy Relations (Max-min Composition). |
| Implementation of Fuzzy Controller (Washing Machine). |
| Implementation of Simple Neural Network (McCulloh-Pitts model). |
| Implementation of Perceptron Learning Algorithm. |
| Implementation of Unsupervised Learning Algorithm. |
| Implementation of Simple Genetic Application. |
| Study of ANFIS Architecture. |
| Study of Derivative-free Optimization. |
| Use of NN-Toolbox in Matlab. |

**ELECTIVE – I**

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| **Image and Video processing** | | **ECS61113** | **3-0-0** | **3 Credits** | |
| **Module 1:**  **Fundamentals of Image processing and Image Transforms:**  Basic steps of Image processing system sampling and quantization of an Image: Basic relationship between pixels Image Transforms: 2D Discrete Fourier Transform, Discrete Cosine Transform (DCT), Discrete Wavelet transforms. | | | | | **[8]** |
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| **Module 2:**  **Image Processing Techniques:** Image Enhancement, Spatial Domain methods: Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial filters, Sharpening Spatial filters, Frequency Domain methods - Basics of filtering in frequency domain, image smoothing, image sharpening, selective filtering Image Segmentation: Segmentation concepts, point, line and Edge detection, Thresholding, region based segmentation. | | | | | **[15]** |
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| **Module 3:**  **Image Compression:** Image compression fundamentals: coding Redundancy, spatial and temporal redundancy. Compression models: Lossy and Lossless, Huffman coding, Arithmetic coding, LZW coding, run length coding, Bit Plane coding, transform coding, predictive coding , wavelet coding, JPEG standards. | | | | | **[10]** |
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| **Module 4:**  **Basic Steps of Video Processing:** Analog video, Digital Video, Time varying Image Formation models, 3D motion models, Geometric Image formation, Photometric Image formation, sampling of video signals, filtering operations.  **2-D Motion Estimation:** Optical flow, general methodologies, pixel based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Waveform based coding, Block based transform coding, predictive coding, Application of motion estimation in video coding. | | | | | **[12]** |
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| **Text Books:** | |
| 1 | “Introduction to Graph Theory”, Douglas B. West, Prentice Hall of India, 2000. |
| 2 | “Graph Theory with Applications to Engineering and Computer Science”, Narsingh Deo, Prentice-Hall, 2004. |
| **Reference Books:** | |
| 1 | “Network Flows: Theory, Algorithms, and Applications”, R. Ahuja, T. Magnanti, and J. Orlin, Prentice Hall. |
| 2 | “Graph Theory”, Frank Harary, Narosa, 2002. |

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| **Image and Video Processing Lab** | **ECS61213** | **0-0-3** | **2 credits** |

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| **Module 1:**  Perform Histogram equalization on an image | | **[9]** |
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| **Module 2:**  Perform Averaging filter in spatial domain | | **[9]** |
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| **Module 3:**   1. Perform Opening and Closing of the image 2. Perform Region of Interest for the image   3. Perform Edge detection algorithm | | **[8]** |
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| **Module 4:**   1. Sharpen image using gradient mask 2. Perform morphological operation on an image.   3. Perform DCT/IDCT computation | | **[4]** |
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| **Advanced Graph Theory** | | **ECS61115** | **3-0-0** | **3 Credits** | |
| **Module 1:**  **Review of basics:** Graphs and digraphs, incidence and adjacency matrices, isomorphism, the auto morphism group; Trees: Equivalent definitions of trees and forests, Cayley's formula, the Matrix-Tree theorem, minimum spanning trees. Cut vertices, cut edges, bonds, the cycle space and the bond space, blocks, Menger's theorem; Paths and Cycles: Euler tours, Hamilton paths and cycles, theorems of Dirac, Ore, Bondy and Chvatal, girth, circumference. | | | | | **[14]** |
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| **Module 2:**  **Matchings:** Berge's Theorem, perfect matchings, Hall's theorem, Tutte's theorem, Konig's theorem, Petersen's theorem, algorithms for matching and weighted matching  (bipartitie and general graphs), factors of graphs (decompositions of the complete graph), Tutte's f-factor theorem. | | | | | **[10]** |
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| **Module 3:**  **Extremal Problems:** Independent sets, covering numbers, Turan's theorem, Ramsey theorems; Colorings: Brooks’s theorem, the greedy algorithm, the Welsh-Powell bound, critical graphs, chromatic polynomials, girth and chromatic number, Vizing's theorem, Graphs on surfaces: Planar graphs, duality, Euler's formula, Kuratowski's theorem, toroidal graphs, 2cell embeddings, and graphs on other surfaces. | | | | | **[9]** |
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| **Module 4:**  **Directed Graphs:** Tournaments, directed paths and cycles, connectivity and strongly connected digraphs, branching.  **Networks and flows:** Flow cuts; max flow min cut theorem; perfect square.  **Random Graphs:** The basic models - use of expectations, simple properties of almost all graphs, almost determined variables – use of variance, Hamiltonian cycles, the phase transition. | | | | | **[12]** |
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| **Text Books:** | |
| 1 | “Introduction to Graph Theory”, Douglas B. West, Prentice Hall of India, 2000. |
| 2 | “Graph Theory with Applications to Engineering and Computer Science”, Narsingh Deo, Prentice-Hall, 2004. |
| **Reference Books:** | |
| 1 | “Network Flows: Theory, Algorithms, and Applications”, R. Ahuja, T. Magnanti, and J. Orlin, Prentice Hall. |
| 2 | “Graph Theory”, Frank Harary, Narosa, 2002. |

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| **Advanced Graph Theory Lab** | | **ECS61215** | **0-0-2** | **2 Credits** |
| **Experiment 1:**  Write a program in C to implement Linear Search and Binary Search. | | | | | |
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| **Experiment 2:**  Write a program in C to find if there is any self-loop in a graph. | | | | | |
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| **Experiment 3:**  Write a program in C to implement Knapsack Problem. | | | | | |
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| **Experiment 4:**  Write a program in C to implement Strassen’s matrix multiplication Algorithm. | | | | | |
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| **Experiment 5:**  . Write a program in C to find the minimum spanning tree using Prim’s Algorithm. | | | | | |
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| **Experiment 6:**  Write a program in C to find the shortest path in a graph using Kruskal’s Algorithm. | | | | | |
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| **Experiment 7:**  Write a program in C to find the shortest path in a graph using Dijsktra’s Algorithm | | | | | |

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| **VLSI Design** | | **EEC61127** | **3-0-0** | **3 Credits** | |
| **Module 1:Intrdoduction to VLSI Design:**  Historical Perspective and Future Trends, Moor’s Law;Scale of Integration (SSI, MSI, LSI, VLSI, ULSI), Types of VLSI Chips (Analog & Digital VLSI chips, General purpose, ASIC, PLA, FPGA), Design principles (Digital VLSI – Concept of Regularity, Granularity etc), Design Domains (Behavioural, Structural ); VLSI design styles: Full custom, Gate array, Standard cell, Micro-cell based design, Field programmable device; Design quality. | | | | | **[9]** |
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| **Module 2:Fabrication technology**  Si semiconductor technology: Wafer preparation, Oxidation, Ion implantation, Different deposition processes, Metallization, Etching, Lithography; Bipolar, CMOS and Bi-CMOS fabrication processes; Layout design rule. | | | | | **[7]** |
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| **Module 3:MOSFET**  MOSFET characteristics threshold voltages, body effect, Chanel length modulation, MOSFET scaling, MOS switch and inverter, The complementary CMOS inverter-DC characteristic, Alternate CMOS inverter, latch up. | | | | | **[7]** |
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| **Module 4:MOS & CMOS Circuit Characterization and Performance Estimation**  Resistance Estimation, Capacitance Estimation: MOS Device Capacitance, Diffusion Capacitance, Routing Capacitance, RC Effects, Capacitance Design Guide; Switching Characteristic: Fall Time, Rise Time, Delay Time; RC Circuit Delay Computation: Cascaded RC Stages, Elmore Delay. Propagation Delay Calculation with Elmore Model for Multiple RC Stages; CMOS Gate Transistor Sizing, Determination of Conductor Size, Power Consumptions: Static Dissipation, Dynamic Dissipation | | | | | **[7]** |
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| **Module 5:CMOS circuit and logic design**  CMOS logic circuit, NMOS and CMOS Logic, Dynamic and Pass-transistor logic, Design of logic gate: Inverter, NAND and NOR gate,CMOS Full Adder ,Multiplexer, Decoder, logic minimization, Advanced CMOS Logic circuits; Sequential CMOS logic circuits; SR Latch circuit, clocked JK Latch/ Master-Slave JK , CMOS D-latch & Edge triggered flip-flop , Series and parallel transistor connection, source drain capacitance, charge sharing, Logic style comparison, Physical layout logic gate, CMOS standard cell design, Layout and layout design rules. | | | | | **[8]** |
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| **Module 6: Semiconductor memories**  SRAM: CMOS SRAM cell, Bipolar SRAM cell; DRAM: basic DRAM cell and its Operation Device design and scaling Considerations for a DRAM Cell; Non-volatile memories: MOSFET nonvolatile memory devices, Flash Memory Arrays, Floating-Gate Nonvolatile Memory Cells, Nonvolatile Memory Cells with Charge Stored in Insulator | | | | | **[7]** |

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| **Text Books:** | |
|  | Digital Integrated Circuit, J.M.Rabaey, Chandrasan, Nicolic, Pearson Education,2nd edition 2003 |
|  | Weste and Eshrighian, ―Principle of CMOS VLSI Design‖ Pearson Education |
|  | Wayne, Walf, “Modern VLSI design: System on Silicon” Pearson Education, 2nd Edition, 1998 |
| **Reference Books:** | |
|  | Pucknull, “Basic VLSI Design” PHI 3rd Edition |

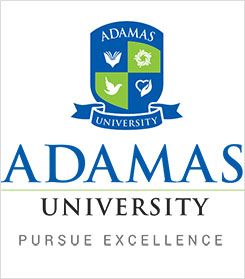
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| **VLSI Design Lab** | **EEC61227** | **0-0-3** | **2 credits** |

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| **List of experiments:**  Combinational Design  1. a) Familiarization with Tanner tools & Layout Design rules.  b) Design & simulate a CMOS Inverter in schematic editor.  c) Obtain the transient response of a CMOS Inverter for different values of W/L.  2. a) Obtain the Voltage Transfer Characteristics (VTC) of CMOS Inverter.  b) Plotting the Drain Current vs Input Voltage.  3. a) Design & simulate a 2 input CMOS NAND gate in schematic editor.  b) Design & simulate a 2 input CMOS NOR gate in schematic editor.  c) Design & simulate a 2 input CMOS XOR gate in schematic editor.  4. Design of (a) Half-Adder, (b) Full Adder, (c) Half Substractor, (d) Full Substractor  in schematic editor.  5. a) Familiarization with Xilinx ISE.  b) Design of (i) 3:8 Decoder and (ii) 8:3 Encoder in Xilinx ISE.  Sequential Design  6. Design of S-R and J-K Flip-flops in Xilinx ISE.  7. Realize a given state transition table by using S-R/ J-K flip-flops.  8. Design of Counter in Xilinx ISE.  Layout Design  10. a) Design layout of CMOS inverter using Tanner Tools – L-Edit.  b) Design layout of CMOS inverter using Magic tool.  11. a) Design layout of a two input CMOS NAND gate using Tanner Tools – L-Edit.  b) Design layout of a two input CMOS NAND gate using Magic tool.  Extras:  1. Design of Binary to Gray and Gray to Binary code Converter.  2. Design of Shift Register.  3. Design of 6-T SRAM cell. |

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| **Mobile Computing** | | **EEC61129** | **3-0-0** | **3 Credits** | |
| **Module 1: Introduction**: Introduction to mobile computing, basics of digital communication and computer networks, Convergence of Internet. Overview of Global System for Mobile Communication (GSM) system: GSM Architecture, Mobility management, Overview of General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes. Sharing of wireless channels: FDMA, TDMA, and CDMA. MAC layer issues in wireless communication. | | | | | **[11]** |
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| **Module 2: Computational Model and algorithm:** Influence of portability and mobility in computational model and algorithms for mobile environment. Handling handoffs, disconnected operation. Analysis of algorithms and termination detection. | | | | | **[8]** |
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| **Module 3: Mobility in cellular based wireless network**: Different types of Mobility, channel allocation, interferences, handoffs, Frequency reuse and location management. IP mobility: Mobile IP and IDMP  Wireless Local Loop (WLL): Introduction to WLL Architecture, wireless Local Loop Technologies. Wireless LAN, Personal Area Network: Bluetooth Wi-Max, Wi-Fi and ZigBee, Familiarization with UWB, LTE, EDGE & MIMO Technologies | | | | | **[10]** |
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| **Module 4: Data delivery models in wireless channel**: push based mechanism and pull based mechanism. Data distribution or dissemination in wireless channels. Broadcast disks. Caching effects. | | | | | **[8]** |
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| **Module 5:Ad Hoc and Sensor Networks:** Introduction, Protocols Challenges. Indexing in Air, Mobile Databases, Distributed file system for mobile environment | | | | | **[8]** |
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| **Mobile Computing Lab** | **EEC61229** | **0-0-3** | **2 credits** |

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| List of experiment of Mobile Computing Lab   1. Study Assignment 1: Detailed study of various section of mobile handset. 2. Study Assignment 1: Detailed study of Bluetooth 3. Study Assignment 2: Detailed study of Code Division Multiple Access (CDMA). 4. Study Assignment 2: Detailed study of Wireless Application Protocol. 5. Study Assignment 3: Detailed study of GSM. 6. Study Assignment 4: Detailed study of GPS. 7. Study Assignment 5: Detailed study of WLAN. 8. Write a program to create a text field and set ticker. 9. Write a program to display the current date and time. 10. Write a program to create text field and add choice group. |



**ADAMAS UNIVERSITY**

**Master of Computer Application (MCA)**

**SEMESTER – IV**

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| **Microprocessor & Embedded System** | **EEC52102** | **3-0-0** | **3 Credits** |

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| **Module 1:** **The Processors : 8086:** Register Organization of 8086, Architecture, Signal Description of 8086, Physical Memory Organization, General Bus Operation, I/O Addressing Capability, Special Processor Activities, Minimum Mode 8086 System and Timings, Maximum Mode 8086 System and Timings. Addressing Modes of 8086. | | **[10]** |
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| **Module 2: Instruction Set, Assembler Directives and Assembly Language Programming of 8086 :**  Machine Language Instruction Formats – Instruction Set of 8086-Data transfer instructions, Arithmetic and Logic instructions, Branch instructions, Loop instructions, Processor Control instructions, Flag Manipulation instructions, Shift and Rotate instructions, String instructions, Assembler Directives and operators, Example Programs, Introduction to Stack, STACK Structure of 8086, Interrupts and Interrupt Service Routines, Interrupt Cycle of 8086, Non-Maskable and Maskable Interrupts, Interrupt Programming, MACROS. | | **[11]** |
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| **Module 3:** **Interfacing Concepts:**  Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – Timer – Keyboard /display controller – Interrupt controller –DMA controller – Programming and applications | | **[10]** |
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| **Module 4: Architecture and comparison of various advanced processors:**  80186, 80286, 80386, 80486, Pentium Case Study on Advanced Multiprocessors | | **[3]** |
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| **Module 5:** **Introduction to Embedded Systems:**  Embedded system – classification, Hardware Components of an Embedded system. Microcontrollers 8051 – Introduction, Architecture, Memory Organization, Instruction Set – Programming. | | **[6]** |
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| **Module 6:** **Embedded Software :**  Programming embedded systems in assembly and C meeting real time constraints, Multi-state systems and function sequences, Embedded software development tools –Emulators and debuggers | | **[5]** |

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| **Text Books:** | |
|  | A.K. Ray and K.M. Bhurchand – Advanced Microprocessors and Peripherals – Architecture, Programming and Interfacing, Tata McGraw Hill,2002 Edition |
|  | Douglas V Hall – Microprocessors and Interfacing – Programming and Hardware, 2nd Edition, Tata McGraw Hill, 2002. |
|  | Steve heath, ―Embedded system design , 2nd edition 2003,Elsevier |
|  | Santanu Chattopadhyay,-- Embedded System Design, 2nd edition,PHI Learning |
| **Reference Books:** | |
|  | Barry B Brey – The Intel Microprocessors 8086/8088, 80816/80188, 80286, 80486 Pentium and Pentium Pro Processor – Architecture, Programming and interfacing, 4th Edition, PHI. |
|  | Shibu. K.V , ―Introduction to Embedded systems, mcgraw hill 2009 |
|  | Frank Vahid , Embedded systems. |

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| **Microprocessor Lab** | **EEC52202** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| 1. Familiarization with 8085 processor & 8051 controller Kit. 2. Add two 8 bit numbers and stored at consecutive memory location. 3. Subtract two 8 bit numbers and stored at consecutive memory location. 4. To multiply two 8 bit numbers and stored at consecutive memory location. 5. To divide two 8 bit numbers and stored at consecutive memory location. 6. To find the largest element in an array. 7. To find the smallest element in an array. 8. To sort the given number in ascending order 9. To sort the given number in descending order 10. To convert decimal to hexadecimal. 11. To convert hexadecimal to decimal. 12. BCD addition. 13. BCD subtraction. 14. Copying a block of memory 15. Shifting a block of memory 16. Interfacing of 8085 with Steeper Motor 17. Interfacing of 8085 with Seven segment display 18. Interfacing of 8085 with Keyboard 19. Interfacing of 8085 with ADC device |

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| **Web Technology** | **ECS52102** | **3-0-0** | **3 Credits** |

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| **Module 1:**  **Internet And WWW:** Introduction, E- Mail, Telnet, FTP, E-Commerce, Video Conferencing, E-Business. Internet Service Providers, Domain Name Server, Internet Address, World Wide Web (WWW): World Wide Web And Its Evolution, Uniform Resource Locator (URL), Browsers - Internet Explorer, Netscape Navigator, Opera, Firefox, Chrome, Mozilla. Search Engine, Web Server - Apache, IIS, Proxy Server, HTTP Protocol. | | **[8]** |
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| **Module 2:**  **HTML And Graphics:** HTML Tag Reference, Global Attributes, Event Handlers, Document Structure Tags, Formatting Tags, Text Level Formatting, Block Level Formatting, List Tags, Hyperlink Tags, Image And Image Maps, Table Tags, Form Tags, Frame Tags, Executable Content Tags.  **Imagemaps:**Introduction, Client-Side Imagemaps, Server-Side Imagemaps, Using Server-Side And Client-Side Imagempas Together, Alternative Text For Imagemaps, Tables : Introduction To HTML Tables And Their Structure, The Table Tags, Alignment, Aligning Entire Table, Alignment Within A Row, Alignment Within A Cell, Attributes, Content Summary, Background Colour, Adding A Caption, Setting The Width, Adding A Border, Spacing Within A Cell, Spacing Between The Cells, Spanning Multiple Rows Or Columns, Elements That Can Be Placed In A Table, Table Sections And Column Properties, Tables As A Design Tool.  **Frames:** Introduction To Frames, Applications, Frames Document, The Tag, Nesting Tag, Placing Content In Frames With The Tag, Targeting Named Frames, Creating Floating Frames, Using Hidden Frames  **Forms:** Creating Forms, The<FORM>Top of Form  Tag, Named Input Fields, The <INPUT> Tag, Multiple Lines Text Windows, Drop Down And List Boxes, Hidden Text, Text Area, Password, File Upload, Button, Submit, Reset, Radio, Checkbox, Select, Option, Forms And Scripting, Action Buttons, Labelling Input Files, Grouping Related Fields, Disabled And Read-Only Fields, Form Field Event Handlers Passing **Form Data Style Sheets:**Introduction, Different Approaches To Style Sheets, Using Multiple Approaches, Linking To Style Information In Separate File, Setting Up Style Information, Using The <LINK>Tag, Embedded Style Information, Using <STYLE> Tag, Inline Style Information.Bottom of Form | | **[17]** |
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| **Module 3:**  **Java Script:** Introduction, Client-Side Javascript, Server-Side Javascript, Javascript Objects, Javascript Security.  **Operators:** Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++ (Increment), -- (Decrement), -(Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ? (Conditional Operator), ,(Comma Operator), Delete, New, This, Void  **Statements:** Break, Comment, Continue, Delete, Do … While, Export, For, For…In, Function, If…Else, Import, Labelled, Return, Switch, Var, While, With,  **Core Javascript:** Array, Boolean, Date, Function, Math, Number, Object, String, Regexp  **Document And Its Associated Objects:**Document, Link, Area, Anchor, Image, Applet, Layer  **Events And Event Handlers:** General Information About Events, Defining Event Handlers: Onabort, Onblur, Onchange, Onclick, Ondblclick, Ondragdrop, Onerror, Onfocus, Onkeydown, Onkeypress, Onkeyup, Onload, Onmousedown, Onmousemove, Onmouseout, Onmouseover, Onmouseup, Onmove, Onreset, Onresize, Onselect, Onsubmit, Onunload | | **[12]** |
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| **Module 4:**  **XML:** Introduction, Anatomy, Document, Creating XML Documents, Creating XML Dtds, XML Schemas, XSL  **PHP:** Introduction, Server-Side Web Scripting, Installing PHP, Adding PHP To HTML, Syntax And Variables, Passing Information Between Pages, Strings, Arrays And Array Functions, Numbers, Basic PHP Errors / Problems | | **[8]** |
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| **Text Books:** | |
| 1 | “Web Design The Complete Reference”, Thomas Powell, Tata Mcgrawhill |
| **Reference Books:** | |
| 1 | “HTML And XHTML The Complete Reference”, Thomas Powell, Tata Mcgrawhill |
| 2 | “PHP : The Complete Reference”, Steven Holzner, Tata Mcgrawhill |
| 3 | “Javascript 2.0 : The Complete Reference”, Second Edition By Thomas Powell And Fritz Schneider |

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| **Web Technology Lab** | **ECS52202** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| Suggested assignments to be framed based on the following Programming Language such as  HTML, CSS, Java script, XML and PHP. |

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| **Compiler Design** | **ECS52104** | **3-0-0** | **3 Credits** |

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| **Module 1:**  **Introduction:** Phases Of Compilation And Overview. | | **[5]** |
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| **Module 2:**  **Lexical Analysis (Scanner):** Regular Language, Finite Automata, Regular Expression, From Regular Expression To Finite Automata, Scanner Generator (Lex,Flex). | | **[6]** |
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| **Module 3:**  **Syntax Analysis (Parser):** Context-Free Language And Grammar, Push-Down Automata, LL(1) Grammar And Top-Down Parsing, Operator Grammar, LR(O), SLR(1), LR(1), LALR(1) Grammars And Bottom-Up Parsing, Ambiguity And LR Parsing, LALR(1) Parser Generator (Yacc,Bison) | | **[10]** |
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| **Module 4:**  **Semantic Analysis:** Attribute Grammar, Syntax Directed Definition, Evaluation And Flow Of Attribute In A Syntax Tree.  **Symbol Table:**  Its Structure, Symbol Attributes And Management. | | **[8]** |
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| **Module 5:**  **Run-Time Environment:** Procedure Activation, Parameter Passing, Value Return, Memory Allocation, And Scope.  **Intermediate Code Generation:** Translation Of Different Language Features, Different Types Of Intermediate Forms.  **Code Improvement (Optimization):** Analysis: Control-Flow, Data-Flow Dependence Etc.; Code Improvement Local Optimization, Global Optimization, Loop Optimization, Peep-Hole Optimization Etc. Architecture Dependent Code Improvement: Instruction Scheduling (For Pipeline), Loop Optimization (For Cache Memory) Etc. | | **[8]** |
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| **Module 6:**  Register Allocation And Target Code Generation  **Advanced Topics:** Type Systems, Data Abstraction, Compilation Of Object Oriented Features And Non-Imperative Programming Languages. | | **[8]** |
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| **Text Books:** | |
| 1 | Compilers: Principles, Techniques And Tools, 2nd Edition, Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Addison-Wesley. |
| **Reference Books:** | |
| 1 | Modern Compiler Implementation In Java, 2nd Edition, Andrew W. Appel , Cambridge University Press. |
| 2 | Compiler Design In C, Allen I. Holub , Prentice-Hall. |
| 3 | Optimizing Compilers For Modern Architectures, 1st Edition, Randy Allen And Ken Kennedy, Elsevier. |

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| **Compiler Design lab** | **ECS52204** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| Implement lexical analyzer using JLex, flex or other lexical analyzer generating tools. Practice of Lex/Yacc of Compiler writing.  writing a scanner, writing predictive parser for a small language, small experiment with scanner (lex/flex) and parser (yacc/byson) generator (such as translation of regular expression to NFA or the construction or parse tree), writing scanner-parse specification for a small language, translation of the language to an intermediate form (e.g. three-address code), generation of target code (in assembly language). |

**ELECTIVE – II**

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| **Applied Graph Theory** | | **ECS52106** | **3-0-0** | **3 Credits** | |
| **Module 1:**  **Basics:** Graph – definition; Degree sequences, Different distance measures in graphs, Special types of graphs – complete graph, regular graph, bipartite graph and their properties. | | | | | **[8]** | |
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| **Module 2:**  **Structure and Symmetry:** Cut vertices, bridges and blocks, auto-morphism groups,  reconstruction problem | | | | | **[8]** | |
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| **Module 3:**  **Trees and Connectivity:** Properties of trees, Arboricity, vertex and edge connectivity, Mengers theorem | | | | | **[6]** | |
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| **Module 4:**  **Eulerian and Hamiltonian Graphs:** Characterization of Eulerian graphs, Sufficient  conditions for Hamiltonian graphs. | | | | | **[4]** | |
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| **Module 5:**  **Colouring and Planar Graphs:** Vertex and edge colouring, perfect graphs, planar  graphs, Euler's theorem, Kuratowski's theorem, Colouring of planar graphs, Crossing number and thickness. | | | | | **[10]** | |
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| **Module 6:**  Matching, factors, decomposition and domination | | | | | **[4]** | |
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| **Module 7:**  **External Graph Theory:** Turan's theorem, Ramsay's theorem, Szemeredi's regularity lemma and their applications. | | | | | **[5]** | |
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| **Text Books:** | |
| 1 | “Graph Theory”, J. A. Bondy and U. S. R. Murthy, SringerVerlag, 2008. |
| 2 | “Introduction to Graph Theory”, D. B. West, PHI, 2004. |
| **Reference Books:** | |
| 1 | “Graph Theory”, R. Diestel, SringerVerlag, 2003. |

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| **Cryptography and Cyber Security** | **ECS52108** | **3-0-0** | **3 Credits** |

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| **Module 1:**  **Symmetric Ciphers:** Overview of Services, Mechanisms and Attacks; OSI  Security Architecture and Network Security Model  **Classical Encryption Techniques:** Symmetric Cipher - Substitution Techniques, Transposition Techniques; Rotor Machines, Steganography, Block Cipher and Data Encryption Standard (DES), Strength of DES, Cryptanalysis - Differential and Linear model. Symmetric Ciphers - Triple DES, Blowfish; Confidentiality using Conventional Encryption - Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation. | | **[9]** |
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| **Module 2:**  Public Key Encryption, Digital Signatures, Prime Number Format’s and Euler’s Theorems, Primality testing. Public Key Cryptography and RSA - Principles of Public Key Cryptosystems, RSA Algorithm, Key Management, Diffie-Hellman Key Exchange. | | **[10]** |
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| **Module 3:**  Authentication Protocol, Message Authentication, Authentication Requirements,  Authentication Functions, Message Authentication Codes, Message Digest - MD5, Digital Signatures and Authentication Protocols. | | **[10]** |
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| **Module 4:**  **Network Security:** Authentication Applications - Kerberos, X.509 Directory  Authentication Service; Electronic Mail Security: Pretty Good Privacy, IP Security -  Overview, Architecture, Authentication Header, Encapsulation Security Payload  **Web Security:** Basic requirements, Secure Sockets Layer and Transport Layer  Security, Secure Electronic Transaction | | **[10]** |
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| **Module 5:**  **System Security:** Intruders, Malicious Software, Viruses and Related Threats,  Counter Measures, Firewalls and their Design Principles. | | **[6]** |
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| Text Books: | |
| 1 | “Cryptography and Network Security”, William Stallings, 4th Edition, Pearson Education/PHI, 2006. |
| Reference Books: | |
| 1 | “Network Security: Private Communication in Public World”, Charlie Kaufman, Radia Perman, Mike Speciner, 2nd Edition, Pearson Education, 2011. |
| 2 | “Cryptography and Network Security”, Atulkahate, TMH, 2003. |

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| **Advanced Database System** | | **ECS61104** | **3-0-0** | **3 Credits** | |
| **Module 1:**  Data Base Analysis and Design Techniques- Review of basic Database Concepts, Database Design Methodologies. ER Modeling: Specialization, Generalization, Aggregation, Normalization Theory. Database Implementation using UML- Introduction to UML, Structure diagrams, behavioral diagrams, object oriented analysis, class diagram.  Advanced Transaction Processing and Concurrency Control- Transaction Concepts, Concurrency Control- Locking Methods, Time stamping Methods, Optimistic Methods for Concurrency Control, Concurrency Control in Distributed Systems | | | | | **[10]** | |
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| **Module 2:**  Query Compiler: Introduction, parsing, generating logical query plan from parse tree. Query Processing: Physical Query plan Operators. Operations- selection, sorting, join, project, set. Query Evaluation: Introduction, Approaches to QE, Transformation of relational expressions in Query optimization, heuristic optimization, cost estimation for various operations, transformation rule. | | | | | **[10]** | |
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| **Module 3:**  Distributed Database- Centralized DBMS and Distributed DBMS, functions and architecture of a DDBMS, Distributed Data Storage, Transparency issues in DDBMS, Query Processing DDBMS, Distributed transaction Management and Protocols, Distributed Concurrency Control and Deadlock Management.  Object Oriented Database Limitations of RDBMS, Need of Complex Data type, Data Definition, ODBMS Fundamentals, issues in OODBMS, Object oriented database design. Comparison of ORDBMS and OODBMS | | | | | **[10]** | |
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| **Module 4:**  Emerging Database Models, Technologies and Applications Multimedia database Emergence, difference from other data types, structure, deductive databases, GIS and spatial databases, Knowledge database, Information Visualization, Wireless Networks and databases, Personal database, Digital libraries, web databases, case studies. | | | | | **[10]** | |
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| **Module 5:**  Data Warehousing: Introduction, basis concepts, data warehouse architecture, data characteristics, reconciled data layer, data transformation, derived data layer, user interface**.**  Authentication and Security – Authentication and Access, DAC, MAC, RBAC, ABAC  SQL Injection Problem, Intrusion Detection and Recovery | | | | | **[5]** | |
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| **Text Books:** | |
| 1 | “Database System Concepts”, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Tata McGraw-Hill. |
| 2 | “Advanced database management system”, Rini Chkrabarti and Shibhadra Dasgupta, Dreamtech. |
| **Reference Books:** | |
| 1 | “Fundamentals of Database Systems” Ramez Elmasri, Shamkant Navathe, Pearson Education |
| 2 | “Distributed Databases” Ozsu and Valduriez ,Pearson Education |

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| **Cloud Computing** | | **ECS61106** | **3-0-0** | **3 Credits** | |
| **Module 1:**  **Introduction:** Shift from distributed computing to cloud computing; principles and characteristics of cloud computing- IaaS, PaaS, SaaS, service oriented computing and cloud environment | | | | | **[10]** | |
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| **Module 2:**  **Cloud Computing Technology:** Client systems, Networks, server systems and security from services perspectives, Accessing the cloud with platforms and applications, cloud storage. | | | | | **[8]** | |
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| **Module 3:**  Working with Cloud- Infrastructure as a Service: conceptual model and working Platform as a Service: conceptual model and functionalities Software as a Service: conceptual model and working Technologies and Trends in Service provisioning with clouds. | | | | | **[12]** | |
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| **Module 4:**  Using Cloud Services- Cloud collaborative applications and services – technology, applications and case studies with calendars, schedulers and event management; cloud applications in project management. | | | | | **[15]** | |
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| **Text Books:** | |
| 1 | “Cloud Computing – A Practical Approach”, Anthony T.Velte, Toby J. Velte and Robert E, TMH , 2010. |
| **Reference Books:** | |
| 1 | “Cloud Computing – Web based Applications”, Michael Miller, Pearson Publishing, 2011. |

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| **Neural Network and Deep Learning** | | **ECS61108** | **3-0-0** | **3 Credits** | |
| **Module 1:**  **Introduction:** what is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks  **Learning Process:** Error Correction learning, Memory based learning, Hebbian learing, Competitive, Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process | | | | | **[10]** |
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| **Module 2:**  **Single Layer Perceptron’s:** Adaptive filtering problem, Unconstrained Organization Techniques, Linear least square filters, least mean square algorithm, learning curves, Learning rate annealing techniques, perception –convergence theorem, Relation between perception and Bayes classifier for a Gaussian Environment.  **Multilayer Perceptron:** Back propagation algorithm XOR problem, Heuristics, Output representation and decision rule, Computer experiment, feature detection. | | | | | **[5]** |
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| **Module 3:**  **Back Propagation:** Back propagation and differentiation, Hessian matrix, Generalization, Cross validation, Network pruning Techniques, Virtues and limitations of back propagation learning, Accelerated convergence, supervised learning.  **Self- Organization Maps:** Two basic feature mapping models, Self-organization map, SOM algorithm, properties of feature map, computer simulations, learning vector quantization, Adaptive patter classification, Hierarchal Vector quantilizer, contexmel Maps.  **Neuro Dynamics:** Dynamical systems, stability of equilibrium states, attractors, neuro-dynamical models, manipulation of attractors’ as a recurrent network paradigm | | | | | **[10]** |
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| **Module 4:**  **Deep Learning:** Recent developments in deep neural networks, Limiting the size of the weights, Using noise as a regularize, The ups and down of back propagation, Introduction to full Bayesian approach, The Bayesian interpretation of weight decay, Mackay's quick and dirty method of setting weight costs.  **Convolutional Neural Networks:** Invariance, stability. Variability models (deformation model, stochastic model), Scattering networks Group Formalism, Supervised Learning: classification, Properties of CNN representations: inevitability, stability, invariance, covariance/invariance: capsules and related models, Connections with other models: dictionary learning, LISTA, other tasks: localization, regression, Embedding (DrLim), inverse problems, Extensions to non-euclidean domains, Dynamical systems: RNNs.  **Deep Unsupervised Learning:** Auto encoders (standard, Denoising, contractive, etc etc), Variational Autoencoders ,Adversarial Generative Networks , Maximum Entropy Distributions. | | | | | **[15]** |
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| **Module 5:**  **Advance Topics:** Non-convex optimization for deep network, Stochastic optimization, Attention and Memory Models , Open Problems. | | | | | **[5]** |

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| **Text Books:** | |
| 1 | “Neural networks A comprehensive foundations”, Simon Hhaykin, Pearson Education 2nd  Edition 2004.” |
| 2 | “Deep Learning”, Ian Goodfellow, Yoshua Bengio, and Aaron Courville, MIT press, 2016. |
| **Reference Books:** | |
| 1 | “Artificial neural networks”, B.Vegnanarayana Prentice Halll of India P Ltd, 2005. |
| 2 | “Neural networks in Computer intelligence”, Li Min Fu, TMH, 2003. |
| 3 | “Neural networks”, James A., Freeman David, M. S. Kapura, Pearson Education. |

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| **Advances in Compiler Design** | | **ECS61110** | **3-0-0** | **3 Credits** | |
| **Module 1:**  **Review of compiler structure:** lexical analysis, parsing, semantic analysis, error recovery and intermediate code generation; Runtime storage management; Code optimization; Code generation;  **Retargetable compiler:** an overview. | | | | | **[10]** | |
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| **Module 2:**  **Introduction to Code optimization:** The importance of code optimization. Structure of optimizing compilers. Placement of optimizations in hugely optimizing compilers. Importance of individual optimizations. Order and repetition of optimization. | | | | | **[5]** | |
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| **Module 3:**  **Optimizing compilers::Basic block:** Peephole optimization.  **Loop optimization:** Induction, [Strength reduction](https://en.wikipedia.org/wiki/Strength_reduction), [Loop fusion](https://en.wikipedia.org/wiki/Loop_fusion), [Loop inversion](https://en.wikipedia.org/wiki/Loop_inversion), [Loop interchange](https://en.wikipedia.org/wiki/Loop_interchange), [Loop-invariant code motion](https://en.wikipedia.org/wiki/Loop-invariant_code_motion), [Loop nest optimization](https://en.wikipedia.org/wiki/Loop_nest_optimization), [Loop unrolling](https://en.wikipedia.org/wiki/Loop_unrolling), [Loop splitting](https://en.wikipedia.org/wiki/Loop_splitting), Loop HYPERLINK "https://en.wikipedia.org/wiki/Loop\_unswitching"unswitching, [Bounds-checking elimination](https://en.wikipedia.org/wiki/Bounds-checking_elimination); [Software pipelining](https://en.wikipedia.org/wiki/Software_pipelining)**,** [Automatic parallelization](https://en.wikipedia.org/wiki/Automatic_parallelization)  [**Data-flow analysis**](https://en.wikipedia.org/wiki/Data-flow_analysis)**:** [Common HYPERLINK "https://en.wikipedia.org/wiki/Common\_subexpression\_elimination"subexpressionHYPERLINK "https://en.wikipedia.org/wiki/Common\_subexpression\_elimination" elimination](https://en.wikipedia.org/wiki/Common_subexpression_elimination); [Constant folding](https://en.wikipedia.org/wiki/Constant_folding)**,** [Induction variable recognition and elimination](https://en.wikipedia.org/wiki/Induction_variable_recognition_and_elimination)**,** [Dead store](https://en.wikipedia.org/wiki/Dead_store) elimination**,** [Use-define chain](https://en.wikipedia.org/wiki/Use-define_chain)**,** [Live variable analysis](https://en.wikipedia.org/wiki/Live_variable_analysis)  **Static single assignment form based:** [Global value numbering](https://en.wikipedia.org/wiki/Global_value_numbering)**,** [Sparse conditional constant propagation](https://en.wikipedia.org/wiki/Sparse_conditional_constant_propagation).  [**Code generation**](https://en.wikipedia.org/wiki/Code_generation_%28compiler%29)**:** [Register allocation](https://en.wikipedia.org/wiki/Register_allocation), [Instruction selection](https://en.wikipedia.org/wiki/Instruction_selection), [Instruction scheduling](https://en.wikipedia.org/wiki/Instruction_scheduling), Rematerialization  **Procedure optimizations**: Tail recursion elimination and tail call optimization, Procedure integration; In-line expansion.  **Global**: Inter-procedural optimizations  **Static analysis:** [Alias analysis](https://en.wikipedia.org/wiki/Alias_analysis), [Pointer analysis](https://en.wikipedia.org/wiki/Pointer_analysis), [Shape analysis](https://en.wikipedia.org/wiki/Shape_analysis_%28software%29), [Escape analysis](https://en.wikipedia.org/wiki/Escape_analysis), [Array access analysis](https://en.wikipedia.org/wiki/Array_access_analysis); [Dependence analysis](https://en.wikipedia.org/wiki/Dependence_analysis), [Control flow analysis](https://en.wikipedia.org/wiki/Control_flow_analysis),  [Data flow analysis](https://en.wikipedia.org/wiki/Data_flow_analysis). | | | | | **[20]** | |
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| **Module 4:**  **Optimizing for parallelism and locality**: Loop level parallelism and data locality, Execution order for loop nests, controlling the order of execution, data reuse; Data dependence analysis; Synchronization-Free Parallelism; Locality Optimizations. | | | | | **[10]** | |

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| **Text Books:** | |
| 1 | Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques and Tools, Addison-Wesley. |
| 2 | Michael L. Scott, Programming Language Pragmatics, Elsevier. |
| 3 | Andrew W. Appel, Modern Compiler Implementation in C/Java, Cambridge University Press. |
| 4 | Steven S. Muchnik, Advanced Compiler Design and Implementation, Elsevier. |
| **Reference Books:** | |
| 1 | Randy Allen and Ken Kennedy, Optimizing Compilers for Modern Architectures, Elsevier. |
| 2 | Allen I. Holob, Compiler Design in C, Prentice-Hall |

**ELECTIVE – III**

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| **Distributed Computing** | | **ECS52110** | **3-0-0** | **3 Credits** | |
| **Module 1:**  **Characterization of Distributed Systems:** Introduction, Examples of distributed  Systems, Issues in Distributes Operating Systems, Resource sharing and the Web Challenges.  **System Models:** Architectural models, Fundamental Models Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport’s & vectors logical clocks, Causal ordering of messages, global state, termination detection.  **Distributed Mutual Exclusion:** Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non-token based algorithms, performance metric for distributed mutual exclusion algorithms. | | | | | **[12]** | |
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| **Module 2:**  **Distributed Deadlock Detection:** system model, resource Vs. communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.  **Agreement Protocols:** Introduction, System models, classification of Agreement Problem-Interactive consistency Problem, Applications of Agreement algorithms. | | | | | **[8]** | |
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| **Module 3:**  **Distributed Objects and Remote Invocation:** Communication between distributed  objects, Remote procedure call, Events and notifications, Java RMI case study. **Transactions and Concurrency Control:** Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control | | | | | **[8]** | |
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| **Module 4:**  **Distributed Transactions:** Introduction, Flat and nested distributed transactions,  Atomic commit protocols, concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Distributed shared memory – Design and Implementation issues, PAXOS algorithm, consistency models, CORBA Case Study: CORBA RMI, CORBA services. | | | | | **[10]** | |
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| **Module 5:**  File service components, design issues, interfaces, implementation techniques, Sun  Network File System – architecture and implementation, other distributed file systems – AFS, CODA. Name services – SNS name service model. Review Results. – Evaluating software quality – defect prevention – testing maturity model | | | | | **[7]** | |
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| **Text Books:** | |
| 1 | “Advanced Concepts in Operating Systems” ,MukeshSinghal and Niranjan G. Shivaratri, Tata McGraw Hill, 2001. |
| 2 | “Distributed System: Concepts and Design”, Coulouris, Dollimore, Kindberg, Pearson Education, 2006. |
| **Reference Books:** | |
| 1 | “Distributed Operating Systems”, S. Tanenbaum, Pearson Education, 2005. |
| 2 | “Distributed System: Concepts and Design”, P. K. Sinha, PHI, 2004. |

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| **Information Retrieval** | | **ECS52112** | **3-0-0** | **3 Credits** | |
| **Module 1:**  **Introduction:** Basics of Information Retrieval and Introduction to Search Engines; Boolean Retrieval: Boolean queries, Building simple indexes, Processing Boolean  Queries | | | | | **[6]** | |
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| **Module 2:**  Term Vocabulary and Posting Lists – Choosing document units, Selection of  terms, Stop word elimination, Stemming and lemmatization, Skip lists, Positional postings and Phrase queries; Dictionaries and Tolerant Retrieval: Data structures for dictionaries, Wildcard queries, Permuterm and Kgramindexes, Spelling correction, Phonetic correction. | | | | | **[8]** | |
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| **Module 3:**  Index Construction – Singlepass scheme, Distributed indexing, Map Reduce,  Dynamic indexing; Index Compression Statistical properties of terms, Zipf's law, Heap's law, Dictionary compression, Postings file compression, Variable byte codes, Gamma codes. | | | | | **[6]** | |
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| **Module 4:**  Vector Space Model – Parametric and zone indexes, Learning weights, Term  frequency and weighting, Tf-Idf weighting, Vector space model for scoring, variant tf-idf functions. | | | | | **[5]** | |
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| **Module 5:**  Computing Scores in a Complete Search System – Efficient scoring Inexact retrieval, Champion lists, Impact ordering, Cluster pruning, Tiered indexes, Query term proximity, Vector space scoring and query operations. | | | | | **[4]** | |
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| **Module 6:**  Evaluation in Information Retrieval: Standard test collections, unranked retrieval  sets, Ranked retrieval results, Assessing relevance, User utility, Precision and Recall,  Relevance feedback, Rocchio algorithm, Probabilistic relevance feedback, Evaluation of relevance feedback. | | | | | **[6]** | |
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| **Module 7:**  Probabilistic Information Retrieval – Review of basic probability theory, Probability ranking principle, Binary independence model, Probability estimates, probabilistic approaches to relevance feedback. Text Classification – Rocchio classifier, K-Nearest  neighbor classifier, Linear and nonlinear classifiers, Bias-variance tradeoff, Naïve  Bayes and Support Vector machine based classifiers. | | | | | **[6]** | |
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| **Module 8:**  Text Clustering – Clustering in information retrieval, Evaluation of clustering, K-Means  and Hierarchical clustering. Introduction to Linear Algebra, Latent Semantic Indexing. | | | | | **[4]** | |
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| **Text Books:** | |
| “An Introduction to Information Retrieval”, C. D. Manning, P. Raghavan, H. Schutze, Cambridge University Press, 2009. |
| **Reference Books:** | |
| “Modern Information Retrieval”, R. Baeza and B. Ribeiro-Neto, Pearson Education, 1999. |

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| **Formal Systems** | | **ECS61118** | **3-0-0** | **3 Credits** | |
| **Module 1:**  Formal languages and their related automata, Turing machines, type-0 languages, linear bounded automata and CSLs. Time and tape bounded Turing machines, time and space bounds for recognizing CFLs. | | | | | **[10]** | |
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| **Module 2:**  Turing Computability- number theoretic computations by Turing machines and indexing. Axiomatic systems, their soundness and completeness. | | | | | **[13]** | |
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| **Module 3:**  Recursive function theory- primitive recursive functions and primitive recursive predicates. Ackermann’s function, recursive and general recursive functions. | | | | | **[12]** | |
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| **Module 4:**  Computability and decidability- computable functions, computable sets, decision problems. Fix point theory of programs, functions and functional, verification methods, Lambda calculus and applications. | | | | | **[10]** | |
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| **Text Books:** | |
| 1 | “Introduction to Automata Theory Languages and Computation”. Hopcroft H.E. and Ullman J. D. Pearson Education |
| 2 | “An Introduction to Functional Programming Through Lambda Calculus”, Greg Michaelson |
| 3 | “Introduction to Theory of Computation” Sipser M. 2nd edition Thomson |
| **Reference Books:** | |
| 1 | “Theory of Computer Science - Automata languages and computation”, Mishra and Chandra shekaran, 2nd edition, PHI |

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| **Principles of Programming Languages** | | **ECS61120** | **3-0-0** | **3 Credits** | |
| **Module 1:**  **Introduction:** Programming language definition, brief history of programming  Languages, overview of programming paradigms.  **Language design principles:** Design criteria, efficiency, regularity | | | | | **[5]** |
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| **Module 2:**  **Syntax:** Lexical structure, Context free grammar, BNF, syntax tree, parse tree, Expression syntax.  **Semantics:** Declaration, allocation, evaluation, symbol table, runtime environment, data types, type checking, weak typing, strong typing, parameter passing methods such as pass by value, pass by name, pass by result, pass by value-result, pass by reference, exceptions and exceptions handling. | | | | | **[8]** |
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| **Module 3:**  **Garbage collection:** Advantages, explicit garbage collection, automatic garbage  Collection compacting.  **Imperative programming:** Impact of Von-Neumann architectures on programming  language, assignments, names, locations, L-value, R-value, memory allocation, scope rules, control flow, control abstraction, functions, exception handling, primitive and constructed data types, data abstraction. | | | | | **[7]** |
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| **Module 4:**  **Object oriented programming:** Objects, classes, methods, dynamic binding,  inheritance, polymorphism, design and implementation issues in object oriented  Languages, case study.  **Declarative programming:** Distinctive features of declarative programming, first order logic, Horn clauses, resolution unification, sequencing of control, negation,  Implementations issues, the language Prolog, constraint logic programming. | | | | | **[10]** |
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| **Module 5:**  **Functional programming:** Distinctive features of functional programming languages, functional programming in imperative language, recursion, tail recursion, higher order functions, lazy evaluation, types in functional programming, mathematics of functional programming: lambda calculus. introduction to functional programming using Scheme Haskell ML. | | | | | **[10]** |
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| **Module 6:**  **Brief introduction to multi-paradigm languages** (Python/Leda/Ada/C#).  **Formal semantics:** Operational semantics, denotational semantics, axiomatic semantics, proof of program correctness. | | | | | **[5]** |
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| **Text Books:** | | | | | | | |
| 1 | “Programming Languages: Principles and practice”, Kenneth C. Louden, 2003. | | | | | | |
| 2 | “Programming Languages and Paradigms”, D. A. Watt, Prentice-Hall, 1990. | | | | | | |
| 3 | “Advanced Topics in Types and Programming Languages”, Benjamin C. Pierce, ed., MIT Press, 2005. | | | | | | |
| **Reference Books:** | | | | | | | |
| 1 | “The Semantics of Programming Languages”, M. Hennessey, John Wiley, 1990. | | | | | | |
| 2 | “Elements of Functional Programming”, C. Reade, Addison Wesley, 1989. | | | | | | |
| **High Performance Computer Architecture** | | | | **ECS61122** | **3-0-0** | **3 Credits** | |
| **Module 1:**  **Introduction:** Review of basic computer architecture, Quantitative techniques in  Computer design, measuring and reporting performance. CISC and RISC processors. | | | | | | | **[5]** |
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| **Module 2:**  **Pipelining:** Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards, and structural hazards, techniques for handling hazards. Exception handling. Pipeline optimization techniques. Compiler techniques for improving performance. Hierarchical memory technology: Inclusion, Locality properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, Mapping and management techniques, Memory replacement policies. | | | | | | | **[10]** |
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| **Module 3:**  **Instruction-level parallelism:** Basic Concepts, Techniques for increasing ILP, Dynamic scheduling (Tomasulo's Algorithm), Reorder buffer and instruction commit, Branch prediction and advanced instruction delivery, Speculative execution. Superscalar, Super pipelined and VLIW processor architectures. Array and vector processors. | | | | | | | **[12]** |
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| **Module 4:**  **Multiprocessor architecture:** Taxonomy of parallel architectures. Centralized shared memory Architecture. Synchronization, Memory consistency, Interconnection networks. Distributed shared memory architecture. Model of memory consistency, Cache coherency, Multiprocessing snooping protocol, Multiprocessing directory protocol. Cluster computers. | | | | | | | **[10]** |
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| **Module 5:**  **Non von Neumann architectures:** Data flow computers, Reduction computer  Architectures, Systolic architectures. Multicore Architectures. | | | | | | | **[8]** |
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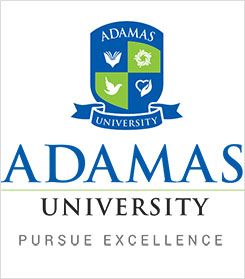
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| **Text Books:** | |
| 1 | “Computer Architecture: A Quantitative Approach”, John L. Hennessy and David A. Patterson, Morgan Kaufmann. |
| 2 | “Modern Processor Design: Fundamentals of Superscalar Processors”, John Paul Shen and Mikko H. Lipasti, Tata McGraw-Hill. |
| **Reference Books:** | |
| 1 | “Computer Architecture: Pipelined and Parallel Processor Design”, M. J. Flynn, Narosa  Publishing. |
| 2 | “Advanced Computer Architecture: Parallelism, Scalability, Programmability”, Kai Hwang, McGraw-Hill. |

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| **Natural language Processing** | | **ECS61124** | **3-0-0** | **3 Credits** | |
| **Module 1:**  **Introduction:** Knowledge in Speech and Language Processing, Ambiguity, Models and Algorithms, Language, Thought, and Understanding, Machine Learning and NLP. | | | | | **[10]** |
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| **Module 2:**  **Words:** Regular Expressions and Automata; Morphology fundamentals; Morphological Diversity in Languages; Morphology Paradigms; Probabilistic Models of Pronunciation and Spelling; N-grams, N-grams for Spelling and Pronunciation ;Overview of Hidden Markov Models; Maximum Entropy Models | | | | | **[10]** |
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| **Module 3:**  **NLP tasks:** A coarse division **Syntax**: Lemmatization, Morphological segmentation, Part-of-speech tagging, Parsing, combination of rule Based and probabilistic Parsing, Scope Ambiguity resolution, Sentence boundary disambiguation, Stemming, Word segmentation.  **Semantics:** Lexical, Machine translation, Named entity recognition, Topic segmentation and recognition; Word sense disambiguation; WSD and Multilingualism; Metaphors.  **Discourse:** Automatic summarization; Discourse analysis Speech: Speech recognition; Speech segmentation; Text-to-speech. | | | | | **[15]** |
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| **Module 4:**  **Applications:**  Sentiment Analysis, Recognizing Textual entailment; Relationship extraction; Robust and Scalable Machine Translation; Question Answering; Information Retrieval across languages. | | | | | **[10]** |

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| **Text Books:** | |
| 1 | Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995. |
| 2 | Jurafsky, Dan and Martin, James, Speech and Language Processing, Second Edition, Prentice Hall, 2008. |
| **Reference Books:** | |
| 1 | Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999. |
| 2 | Charniack, Eugene, Statistical Language Learning, MIT Press, 1993. |

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| **HSS-IV (Economics For Engineers)** | **HEC42180** | **3-0-0** | **3 credits** |

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| **Module 1: Basic Concepts and Theories of Economics**   * Introduction to The Literature of Microeconomics centering around Decision Making at Individual Level * Some Fundamental Concepts: Maximization, Equilibrium, and Efficiency * The Theory of Consumer Choice and Demand * The Theory of Supply * Market Equilibrium * Market Structure * Market Failure and Environmental Issues * Game Theory * Concept of Yield and Theories of Term Structure * The Theory of Asset Pricing * Decision-Making under Uncertainty: Risk and Insurance | | **20** |
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| **Module 2: Sustainability Study of a Project**   * Budget plan * Estimation of the project cost * Prices, fees and cost recovery * Financing of recurrent costs * Sustainability of the activities generated by the project | | **10** |
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| **Module 3: Economic Feasibility Study**   * Problem of Pricing under Oligopoly * Problem of Market Stagnation * Problem of Volatility in Open Economy * Problem of Global Meltdown * Problem of Financing a Project | | **12** |
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| **Module 4: Project Report**   * Facets of Project Viability – Commercial, Technical, Financial * Outline of a Model Project Report * A Real Life Case Study | | **03** |



**ADAMAS UNIVERSITY**

**Master of Computer Application (MCA)**

**SEMESTER – V**

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| **Management Information System** | **MBA53101** | **3-1-0** | **3 Credits** |

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| **Module 1:**  **Basics of MIS & DSS**  Organizations- Processing of Inputs to Outputs-Impact of Information Technology in Management Decision Making-IS and Business Strategy - Value Chain Model (Porter, 1985) - 5 Forces Model (Porter, 1985) - Core Competency - Competitive Edge - MIS: Tiered needs for information, MIS, DSS, EIS, AI  . | | **[8]** |
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| **Module 2:**  Parallel And Perspective Projections –3D Object Representation –Polygons, Curved Lines, Splines, Quadric Surfaces - Visualization Of Data Sets - 3D Transformations – Viewing -Visible Surface Identification **Technology of Information System**  System Architecture, Infrastructure & Platforms Telecom & Networks, Wireless Technologies, Security & Controls Application Software, IS Products and Services: CRM, SCM, ERP, Internet, Intranet, Extranet | | **[8]** |
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| **Module 3:**  **System & System Design**  Approaches to IS Development - System Development Life Cycle (SDLC) -Prototyping, RAD, and Phases in SDL- Requirement Analysis, Design, Implementation and Maintenance - Software Packages - concepts, implementation methodologies - Make or Buy software - Outsourcing issues. | | **[10]** |
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| **Module 4:**  **Managerial Decision Making**  Decision making processes and people, Decision Support System, Decision Making vs. Problem Solving, Structured, Unstructured and semi - structured problems, programmable and non-programmable decisions, Bounded Rationality, Simon's Model | | **[4]** |
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| **Module 5:**  **Database, Data Warehousing, Data Mining**  Database Management Systems: concepts, design, SQL programming - Data Warehousing: Concepts. Data Mining: Concepts.  **Database, Data Warehousing, Data Mining**  Database Management Systems: concepts, design, SQL programming - Data Warehousing: Concepts. Data Mining: Concepts. | | **[9]** |
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| **Text Books:** | |
| 1 | Management Information Systems by Obrien, Marakas and Ramesh Behl,TMGH |
| 2 | Management Information Systems by Jawadekar, TMGH, 4th Edition |
| **Reference Books:** | |
| 1 | Management Information Systems by Laudon, Laudon, Dass, Pearson Education Asia, 11th Edition |

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| **Computer Graphics** | **ECS53101** | **3-0-0** | **3 Credits** |

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| **Module 1:**  Output Primitives –Algorithms For Line, Circle And Ellipse Drawing - Attributes Of Output Primitives – 2D Geometric Transformation –2D Viewing – Algorithms For Line, Polygon, Curve And Text Clipping Algorithms. | | **[9]** |
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| **Module 2:**  Parallel And Perspective Projections –3D Object Representation –Polygons, Curved Lines, Splines, Quadric Surfaces - Visualization Of Data Sets - 3D Transformations – Viewing -Visible Surface Identification | | **[9]** |
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| **Module 3:**  Color Models – RGB, YIQ, CMY, HSV – Animations – General Computer Animation, Raster, Keyframe - Graphics Programming Using OPENGL – Basic Graphics Primitives –Drawing 3D Objects - Drawing 3D Scenes. | | **[12]** |
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| **Module 4:**  Introduction To Shading Models – Flat And Smooth Shading – Adding Texture To Faces – Adding Shadows Of Objects – Building A Camera In A Program – Creating Shaded Objects – Rendering Texture – Drawing Shadows. | | **[6]** |
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| **Module 5:**  Fractals And Self Similarity – Peano Curves –Iterated Functions –Mandelbrot Sets – Julia Sets – Random Fractals – Overview Of Ray Tracing –Intersecting Rays With Other Primitives – Adding Surface Texture – Reflections AndTransparency – Boolean Operations On Objects. | | **[9]** |
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| **Text Books:** | |
| 1 | Computer Graphics With Open GL, 4th Edition, Donald D. Hearn, M. Pauline Baker, Warren Carithers, Pearson Education |
| 2 | Computer Graphics Using OPENGL, Third Edition,F.S. Hill, Pearson Education. |
| **Reference Books:** | |
| 1 | Computer Graphics- Principles And Practice, Third Edition,[John F. Hughes](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22John+F.+Hughes%22), [Andries Van Dam](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Andries+Van+Dam%22), [James D. Foley](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22James+D.+Foley%22), [Steven K. Feiner](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Steven+K.+Feiner%22), Addison-Wesley |

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| **Computer Graphics Lab** | **ECS53201** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| Programming for generating lines, curves and rendered surfaces. Interactive graphics programming: modeling and updating objects in an object hierarchy, video games, computer animation and realistic image synthesis. |

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| **Artificial Intelligence** | **ECS53103** | **3-0-0** | **3 Credits** |

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| **Module 1:**  Introduction – Agents – Problem Formulation – Uninformed Search Strategies – Heuristics – Informed Search Strategies – Constraint Satisfaction | | **[9]** |
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| **Module 2:**  Logical Agents – Propositional Logic – Inferences – First-Order Logic – Forward Chaining – Backward Chaining – Unification – Resolution | | **[11]** |
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| **Module 3:**  Planning With State-Space Search – Partial-Order Planning – Planning Graphs – Planning And Acting In The Real World | | **[9]** |
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| **Module 4:**  Uncertainty Revision Of Probability - Probabilistic Reasoning – Bayesian Networks –Inferences In Bayesian Networks – Temporal Models – Hidden Markov Models | | **[8]** |
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| **Module 5:**  Learning From Observation - Inductive Learning – Decision Trees – Explanation Based Learning – Statistical Learning Methods - Reinforcement Learning | | **[8]** |
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| **Text Books:** | |
| 1 | Artificial Intelligence – A Modern Approach, Second Edition, S. Russel And P. Norvig Pearson Education, 2003. |
| **Reference Books:** | |
| 1 | Computational Intelligence: A Logical Approach”, David Poole, Alan Mackworth, Randy Goebel, First edition; Oxford university press, 2004. |
| 2 | Artificial Intelligence: Structures And Strategies For Complex Problem Solving”, Fourth Edition, G. Luger , Pearson Education, 2002. |

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| **Artificial Intelligence Lab** | **ECS53203** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| Familiarization with LISP and PROLOG Language.  Implementation based on searching technique such as heuristic search techniques, constraint satisfaction problems, stochastic search methods. Game Playing: minimax, alpha-beta pruning. |

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| **HSS-V (Financial Accounting)** | **HEC43181** | **3-0-0** | **3 credits** |

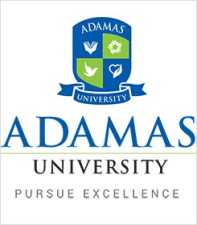
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| **Unit 1:** Meaning and scope of accounting- introduction, meaning of accounting, objectives of accounting, functions of accounting, book-keeping, distinction between book-keeping and accounting, sub-fields of accounting, users of accounting information, relationship of accounting with other disciplines, limitations of accounting, use of mathematics in accounting, accounting concepts, principles and conventions. | | **15** |
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| **Unit 2:** Basic accounting procedures in journal entries, accounting equation approach, traditional approach, ledgers, trial balance. | | **06** |
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| **Unit 3:** Subsidiary books – other than cash book, cash book, capital and revenue expenditures, capital and revenue receipts, contingent assets and contingent liabilities. | | **06** |
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| **Unit 4:** Rectification of errors, basis of inventory valuation and record keeping, average due date and current account. | | **05** |
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| **Unit 5:** Bank reconciliation statement, depriciation accounting, consignment and joint ventures. | | **05** |
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| **Unit 6:** Preparation of final accounts of sole proprietors, final accounts of manufacturing entities, accounting of non-profit organisation, preparation of receipt and payment account, income and expenditure account and balance sheet. | | **08** |

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| **Seminar** | **ECS53301** | **0-2-0** | **2 Credits** |

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| The course involves presentation and report submission by every student. Reference search and technical writing skills along with effective presentation skills are focussed. The course strengthens the research attributes including literature survey. |

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| **Project – I** | **ECS53401** | **0-0-6** | **4 Credits** |

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| The course encourages students to take project works that are based on current trends and technologies in various subjects, which will augment the theory subjects. The students will form a group to do their project work. This teaming is to encourage team spirit and to insist the importance of team work. The students typically undergo group formation, finalization of area of work, testing, generation and verification of results, and possible research publication procedure. |



**ADAMAS UNIVERSITY**

**Master of Computer Application (MCA)**

**SEMESTER – VI**

**Elective IV**

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| **Computational Complexity** | | **ECS61116** | **3-0-0** | **3 Credits** | |
| **Module 1:**  Models of computation, Problem Definitions , Models of Computation , FSM Language Recognition , TM Language Recognition , The Classes P and NP , NP-complete Languages | | | | | **[5]** |
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| **Module 2:**  Classes P and NP, The classes P and NP, NP-complete languages, Proof that CIRCUIT SAT is NP-complete.  NP-complete languages, NAESAT is NP-complete, 0-1 integer programming is NP-complete, INDEPENDENT SET is NP-complete, and CLIQUE is NP-complete. | | | | | **[8]** |
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| **Module 3:**  Space complexity, Complexity Classes, Proper Resource Bounds, Hierarchy Theorems, Savitch's Theorem.  Complements of Complexity classes, Review of Space Complexity, Complements of Complexity Classes, coNP, Polynomial Time Hierarchy. | | | | | **[7]** |
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| **Module 4:**  PSPACE- complete Languages, Complexity Class Containment, Polynomial Hierarchy, **PH** Complete Problems, Games and TQBF, TQBF is **PSPACE**-Complete.  Diagonalization and Reduction, A First Application of Diagonalization , Halting is Undecidable Resource-Bounded Reductions , Log space Reductions , Hard and Complete, Problems, Diagonalization , Time Hierarchy Theorem , Oracle Turing Machines, Under Relativization Both **P** = **NP** and **P** ≠ **NP.** | | | | | **[10]** |
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| **Module 5:**  Parallel Complexity Classes, Turing Machines and Complexity, Parallel Models of Computation, The PRAM and Complexity Classes, Circuits and Complexity Classes **NC** and **P**/poly*.*  Randomized Computation, Randomized algorithms, Average case complexity, Bounded-error complexity classes, Identity and Primality testing. | | | | | **[6]** |
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| **Module 6:**  Interactive Proof I, Randomized Reductions, Two- and Three-Stage Proofs, Interactive Proofs and IP.  Interactive proofs II, Interactive Proofs, Private versus Public Randomness, Bounding the Prover's Resources.  Interactive Proofs III, interactive Proofs, One-way functions, Zero-Knowledge Proofs  IP and PSPACE, The Power of Interactive Proofs, Probabilistically Checkable Proofs. | | | | | **[9]** |
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| **Text Books:** | |
| 1 | “Computational Complexity: A Modern Approach”, Sanjeev Arora and Boaz Barak, Cambridge University Press. |
| 2 | “Models of Computation, Exploring the Power of Computing”, John E. Savage, Pearson, 1997. |
| **Reference Books:** | |
| 1 | “Elements of The Theory of Computation”, H. Lewis and C. Papadimitriou, Prentice Hall, 1998. |
| 2 | “Introduction to automata theory, languages, and computation”, J Hopcroft and J Ullman, Addison-Wesley, 1979. |

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| **Internet of Things (IoT)** | | **EEC61128** | **3-0-0** | **3 Credits** | |
| **Module 1: Introduction to Internet On Things (IoT) :**Technologies involved in IoT Development. IoT Architecture: History of IoT, M2M – Machine to Machine, Web of Things, IoT protocols.  **Applications of IoT**: Remote Monitoring & Sensing, Remote Controlling, Performance Analysis. The Layering concepts, IoT Communication Pattern, IoT protocol Architecture, The 6LoWPAN architecture. | | | | | **[12]** |
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| **Module 2:Internet/Web and Networking Basics:** OSI Model, Data transfer referred with OSI Model, IP Addressing, Point to Point Data transfer, Point to Multi Point Data transfer & Network Topologies, Sub-netting, Network Topologies referred with Web, Introduction to Web Servers, Introduction to Cloud Computing.  **Overview of IoT Platform**: Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards.  **Network Fundamentals**: Overview and working principle of Wired Networking equipment’s; Router, Switches, Overview and working principle of Wireless Networking equipment’s; Access Points, Hubs etc. Linux Network configuration Concepts: Networking configurations in Linux Accessing Hardware & Device Files interactions | | | | | **[12]** |
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| **Module 3: IoT Application Development**: Application Protocols MQTT, REST/HTTP, CoAP, MySQL  **Back-end Application Designing**: Apache for handling HTTP Requests, PHP & MySQL for data processing, MongoDB Object type Database, HTML, CSS & jQuery for UI Designing, JSON lib for data processing, Security & Privacy during development, Application Development for mobile Platforms: Overview of Android / IOS App Development tools | | | | | **[13]** |
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| **Module 4: Case Study & advanced IoT Applications**: IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipments. Use of Big Data and Visualization in IoT, Industry 4.0 concepts. Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino) | | | | | **[8]** |
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| **Text Books:** | |
|  | Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, Dr. Ovidiu Vermesan, Dr. Peter Friess, River Publishers |
|  | 6LoWPAN: The Wireless Embedded Internet, Zach Shelby, Carsten Bormann, Wiley |
| **Reference Books:** | |
|  | Asoke K Talukder and Roopa R Yavagal, “Mobile Computing,” Tata McGraw Hill, 2010 |
|  | Internet of Things (A Hands-on-Approach) , Vijay Madisetti , Arshdeep Bahga |
|  | Data and Computer Communications; By: Stallings, William; Pearson Education Pte. Ltd., Delhi, 6th Edition |

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| **E-Commerce** | | | **MBA61142** | **3-0-0** | **3 Credits** | |
| **Module 1:**  E-commerce: The revolution is just beginning, Ecommerce : A Brief History, Understanding E-commerce: organizing Themes | | | | | | **[7]** | |
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| **Module 2:**  E-commerce Business Models, Major Business to Consumer (B2C) business models, Major Business to Business (B2B) business models, Business models in emerging E-commerce areas, How the Internet and the web change business: strategy, structure and process, The Internet: Technology Background, The Internet Today, Internet II- The Future Infrastructure, The World Wide Web, The Internet and the Web : Features | | | | | | **[16]** | |
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| **Module 3:**  Building an E-commerce Web Site: A systematic Approach, The e-commerce security environment, Security threats in the e-commerce environment, Technology solution, Management policies, Business procedures, and public laws, Payment system, E-commerce payment system, Electronic billing presentment and payment . | | | | | | **[10]** | |
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| **Module 4:**  Consumer online: The Internet Audience and Consumer Behaviour, Basic Marketing Concepts, Internet Marketing Technologies, B2C and B2B E-commerce marketing and business strategies, The Retail sector, Analyzing the viability of online firms, E-commerce in action: E-tailing Business Models, Common Themes in online retailing, The service sector: offline and online, Online financial services, Online Travel Services, Online career services | | | | | | **[12]** | |
|  | |  | | | | | |
| **Text Books:** | | | | | | | |
| 1 | “ . Kenneth C. Laudon, E-Commerce : Business, Technology, Society, 4th Edition, Pearson | | | | | | |
| 2 | “ S. J. Joseph, E-Commerce: an Indian perspective, PHI | | | | | | |

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| **HSS-VI (Basics of Organizational Behaviors)** | **HPS44101** | **3-0-0** | **3 credits** |

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| **Module 1:** Introduction: Historical development; concept of organization; elements of organizational structure; scope of organizational behaviour. | | 5 |
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| **Module 2:** Motivation and job satisfaction: Major theories; content and process; (Adams, Maslow, Vroom, Herzberg). Intrinsic and extrinsic motivation; incentive systems - Job satisfaction; concept and determinants. | | 8 |
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| **Module 3:** Leadership: Functions and approaches; trait, behavioural and contingency models; characteristics of successful leaders; role of power in leadership | | 8 |
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| **Module 4:** Communication: Communication process- types of communication; communication channels and networks; barriers to communication. | | 8 |
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| **Module 5:** Group behavior and conflict: Defining and classifying groups; stages of group development; concept, causes and consequences of conflicts; methods of conflict-resolution. | | 8 |
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| **Module 6:** Behavior in organizations: Human perception and motivation, human learning and problem solving, people are unique, groups in organizations, leader and group effectiveness | | 8 |

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| **Text Books:** | |
| 1 | Aamodt, M. G. (2001). Industrial/organizational psychology. New Delhi: Cengage |
| 2 | Luthans, F. (2005). Organizational behavior(12thEd.). New York: McGraw Hill. |
| 3 | Muchincky. (2009). Psychology applied to work. New Delhi: Cengage. |
| **Reference Books:** | |
| 1 | Robbins , S., Judge, T.A., &Sanghi, S. (2009). Organizational behavior(13th Ed.). New Delhi: Pearson Education. |
| 2 | Riggio, R. E. (2003) Introduction to Industrial/Organizational Psychology (4th d.). New Jersey: Prentice-Hall . |

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| **Project – II** | **ECS53402** | **0-0-12** | **8 Credits** |

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| The course encourages students to take project works that are based on current trends and technologies in various subjects, which will augment the theory subjects. The students will form a group to do their project work. This teaming is to encourage team spirit and to insist the importance of team work. The students typically undergo group formation, finalization of area of work, testing, generation and verification of results, and possible research publication procedure. |

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| **Comprehensive Viva** | **ECS53302** | **0-0-0** | **4 Credits** |

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| The course tests the technical knowledge acquired during the study, spoken skills, and the ability to think logically under time pressure. The course proves extremely useful for placement interviews. |