

**ADAMAS UNIVERSITY**

**Bachelor of Computer Application (BCA)**

**SEMESTER – I**

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| **INTRODUCTION TO COMPUTER SCIENCE** | **ECS31109** | **2-1-0** | **3 Credits** |

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| **Module 1**  **Introduction to Computers**:Basic Concept, Different types of computer, Characteristics of Computer, Block Diagram of Computer, classification of Computer: Mini, Micro, Main-Frame and Super Computers, Types of Programming Languages: Machine Languages, Assembly Languages and High Level Languages. | | **[10]** |
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| **Module 2:**  **Number Systems And Logic Gates**: Basic Concept, Number Systems, Conversions, Arithmetic System, Signed and Unsigned Numbers, Binary Addition, subtraction, multiplication and division, Logic Gates, Boolean Algebra, Combination of Logic Gates. | | **[8]** |
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| **Module 3:**  **Data Organization and Memories**: Data Organization: Drives, Files and Directories, Types of Memories: RAM ROM, PROM, EPROM, and Secondary Memories: Floppies, Hard Disc, Pen drives, CD; I/O Devices: Scanners, Digitizers, LCD, Optical Input Devices etc.  Hard Drive Performance: Average Access Time, Data Transfer Rate, Optimizing Disk Performance, Disk Cleanup, Defragmentation, File Compression, Drive Interface. | | **[9]** |
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| **Module 4:**  **Computer Organization**: Central processing unit; Machine Cycles; Volatile and Non-Volatile Memory, Flash Memory. Factors affecting Processing Speed, Registers, Memory and Computing Power, Clock. Buses- Data Bus, Address Bus and control Bus. Cache Memory. | | **[8]** |
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| **Module 5:**  **Operating Systems**: Need of Operating System, Types of Operating System, User Interface- Command Line and Graphical user Interface, Hardware Management: Device Drivers, Interrupts Processing, and Utility Software.  Features of Different Operating System: DOS, Windows NT, Windows 9X, Windows 2000 Professional, Windows XP, The Macintosh Operating System, UNIX, LINUX | | **[10]** |
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| **Text Books:** | |
| 1 | Peter Nortons -Introduction to Computers, Sixth Edition, Published by Tata McGraw Hill. |
| **Reference Books:** | |
| 1 | Rajaraman V. – Fundamental of Computers, Prentice Hall of India Pvt. Ltd., New Delhi – 2nd edition, 1996. |
| 2 | Computer Fundamentals By P K Sinha & Priti Sinha Fourth Edition. |

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| **PROGRAMMING IN C** | **ECS31111** | **3-1-0** | **4 Credits** |

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| **Module 1:**  **Basics of C Programming :** Characters used in C, Identifiers, Keywords, Data type & sizes, Constants &Variables, Different types of Operators, Standard Input/output functions, control Flow, if-else, switch-case, Loop Control Statements, for loop, while loop, do-while loop, nested loop, break, continue, goto label and exit( ) function. | | **[8]** |
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| **Module 2:**  **Functions and Pointers:** Basic Concept of Function, Declaration or Prototype of Function, Types of Functions, Call by Value, Call by Reference, Recursion, Tail Recursion, Definition of Pointer, Declaration of Pointer, Operators used in Pointer, Pointer Arithmetic, Functions with Pointer. | | **[7]** |
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| **Module 3:**  **Introduction to Data Structures:** Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT)  **Arrays and String:** Definition, Single and Multidimensional Arrays, Representation of Arrays - Row Major Order, and Column Major Order, Application of arrays – searching and sorting, Sparse Matrices and their representations. Definition of a String, Declaration of a String, Initialization of a String, Various String Handling Functions with example  **Structures and Unions:** Definition of a Structure, Declaration of a Structure & Structure Variable, Initialization of a Structure, Operators used in Structure, Structure within Structures, Union, Difference between a Structure and an Union  **Files:** Types of File, File Processing, Handling Characters, Handling Integers, Random File Accessing, Errors During File Processing | | **[14]** |
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| **Module 4:**  **Stacks and Queues:** ADT Stack, Array Implementation of Stacks, Applications of Stacks: Conversion from Infix to Postfix, Evaluation of Postfix Expressions, Prefix Notation, etc. ADT queue, Linear Queue, Circular Queue, Priority Queue, Array Implementations of Queues, and Applications of Queues Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue. | | **[10]** |
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| **Module 5:**  **Linked lists:** Array and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition.  **Trees**: Basic terminology, Binary Trees, Binary Tree Representation: Array and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Pre-order and Postorder, Threaded Binary trees, TraversingThreaded Binary trees, Huffman algorithm. | | **[12]** |
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| **Module 6:**  **Graphs:** Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal’s algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks. | | **[9]** |
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| **Text Books:** | |
| 1 | “The Complete Reference”, 4th Edition by Herbert Schildt, Tata Mcgraw Hill Education |
| 2 | “Data Structures Using C”, 7th Edition by Aaron M. Tenenbaum, YedidyahLangsam and Moshe J. Augenstein, PHI Learning Private Limited, Delhi India |
| **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 |
| 3 | “Data Structures and Program Design in C”, 2nd Edition by Robert Kruse, C. L. Tondo, Bruce Leung, Shashi Mogalla, Pearson Education |

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| **C PROGRAMMING LAB** | **ECS31211** | **0-0-2** | **2 Credits** |

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| **Laboratory:** |
| Familiar with LINUX commands and vi editor.  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, Recursion, Structures and Files.  Implementation based on stack Queues and link list for example insertion and deletion. |

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| **Environmental Science** | **SGY31111** | **2-1-0** | **3 Credits** |

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| **Module 1**  **Introduction of environmental science:** Multidisciplinary nature of environmental studies; scope and importance; need for public awareness; concept of sustainability and sustainable development  **Natural Resources:** Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people, Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems, Energy resources: Fossil fuel, renewable source of energy: solar, wind power, hydroelectric, biomass, geothermal | | **[10]** |
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| **Module 2**  **Environmental Pollution:** types, causes, effects and controls; Air, water, soil and noise pollution, Nuclear hazards and human health risks, Pollution case studies | | **[10]** |
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| **Module 3:**  **Ecosystem and biodiversity:** Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Food chains, food webs and ecological pyramids  Levels of Biodiversity: genetic, species and ecosystem diversity. Biogeographical classification of India, Values of biodiversity, India as a mega-diversity nation, Biodiversity hotspots, Threats to Biodiversity, In-situ and Ex-situ conservation of Biodiversity | | **[5]** |
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| **Module 4:**  **Waste minimization and cleaner technology:** Waste minimization techniques, Waste reuse, Waste recovery, Waste recycling, Establishing a waste minimization program, benefits and limitations of waste minimization, cleaner technology | | **[10]** |
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| **Module 5:**  **Global issues:** Global Warming, Ozone layer depletion, Acid rain  **Legal and regulatory actions for environmental protection:** The Wildlife (Protection) Act, 1972, Amendment 1991, The Water (Prevention and Control of Pollution) Act, 1974, The National Environment Appellate Authority Act, 1997, Water (Prevention and Control of Pollution) Cess Act, 1977, The Forest (Conservation) Act, 1980, The Air (Prevention and Control of Pollution) Act, 1981, The Environment (Protection) Act, 1986.  International convention and protocols | | **[10]** |

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| Text Books: | |
| 1 | “Principles of Environmental Science”, 4th edition by Cunningham, W.P. and Cunningham, M.A. (2002), Tata McGraw-Hill Publishing Company, New Delhi |
| 2 | Principles of Environmental Science, by K. Saravanan, S. Ramachandrana and R.Bhaskar, New Age international Pvt. Ltd, New Delhi |
| Reference Books: | |
| 1 | Environmental Science, by Santra S.C. (2011), New Central Book Agency |
| 2 | Rajagopalan R. (2015), Environmental Studies: From Crisis to Cure, Oxford University Press |
| 3 | “Introduction to Environmental Engineering and Science”, by Masters, G.M., Prentice Hall of India, Second Indian Reprint. |

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| **Communication Skills** | **HEN31117** | **2-1-0** | **3 Credits** |

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| **Sl. No.** | **UNIT** | **TOPICS** | **HOURS** |
| 1 | **I** | Introduction to Communication – Communication Model –Types of Communications – Barriers to Communication – Effective means of communication. | **[5]** |
| 2 | **II** | Reading Skills – Importance of Reading – Types of Reading – Effective reading skills | **[5]** |
| 3 | **III** | Listening Skills – Importance of Listening – Types of Listening – Barriers to Listening | **[5]** |
| 4 | **IV** | Writing Skills – Importance of writing skills – Effective means of written communication – Letter Writing – Report Writing – Memo writing – Summary writing | **[10]** |
| 5 | **V** | Presentation Skills – Different types of Presentation skills – Non verbal Communications – Group Discussions – Use of Visual aids | **[6]** |
| 6 | **VI** | Grammar and Vocabulary – Parts of Speech – Tense – Subject Verb agreement- Types of sentences – Active and Passive voice – Synonyms – Antonyms - Indianisms | **[12]** |

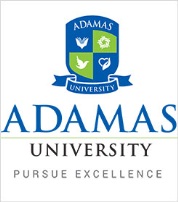
**Text Books:**

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| 1. | Sharma Sangeeta, Mishra Binod; Communication skills for Engineers and Scientists; Prentice Hall India Learning Private Limited; 2009 |
| 2. | Muralikrishna, Mishra Sunita; Communication Skills for Engineers; Pearson Education India; 2011 |
| 3. | Raman, Meenakshi; Sharma Sangeeta; Technical Communication : English Skills for Engineers; OUP India; 2008 |
| 4. | Gupta, M. S; Current English Grammar and Usage; Prentice Hall India Learning Private Limited; 2016 |

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| **Mathematics – I** | **SMA31141** | **2-1-0** | **3 Credits** |

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| **Module 1**  **Algebra of Set:** Mapping and Function, Sets, Subset, Power Set, Union, Intersection, Complement, Set Operations, Venn Diagram, Properties of Set, Laws of Algebra of Sets, Inclusion-Exclusion Principle. Mapping, Different types of Mapping with examples, Function and its properties. | | **[7]** |
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| **Module 2:**  **Differential Calculus:** Limits of Function and Continuity, Fundamental Properties of Continuous Functions (without proof), geometric meaning of derivative and differential, rules of differentiation, Examples. | | **[8]** |
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| **Module 3:**  **Differentiation:** Definition of Derivative, Rules of Differentiation (Without Proof), Derivatives of Algebraic, Trigonometric, Parametric, Logarithmic, Explicit / Implicit Functions, Second order Derivative with examples, Application: Maxima/Minima of Functions, and its applications. | | **[8]** |
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| **Module 4:**  **Integration and its application:** Definition of Integration, Standard Formulas, Method of Substitution, integration by parts, Partial fraction, Reduction Formulas (Without Proof), Area Bounded by the Curve (Excluding volume) and its applications. | | **[8]** |
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| **Text Books:** | |
| 1 | B. S. Grewal, Elementary Engineering. Mathematics, Khanna Publishers |
| 2 | B. K. Pal and K. Das, BCA Mathematics (Volume - I), U. N. Dhur& Sons Publishers |
| **Reference Books:** | |
| 1 | Shanti Narayan, “Differential Caluculs”, S.Chand & Company, 1998. |
| 2 | Shanti Narayan, “Integral Calculus”, S. Chand & Company, 1999 |



**ADAMAS UNIVERSITY**

**Bachelor of Computer Application (BCA)**

**SEMESTER – II**

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| **DATA STRUCTURES AND ALGORITHMS** | | **ECS31106** | **3-1-0** | **4 Credits** | |
| **Module 1:**  **Introduction:** Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off.  **Arrays:** Array Definition: 1D array and 2D array, Different array operations: Insertion, deletion, traversing etc.; Algorithms for various operations and Complexity Analysis,  **Searching:** Linear Search and Binary Search Techniques and their complexity analysis. | | | | | **[10]** |
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| **Module 2:**  **Stacks and Queues:** ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis. | | | | | **[8]** |
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| **Module 3:**  **Linked Lists:** Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.  **Trees:** Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis. | | | | | **[14]** |
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| **Module 4:**  **Sorting and Hashing**: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.  **Graph:** Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis. | | | | | **[13]** |
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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 |

**Subject Name: DATA STRUCTURES AND ALGORITHMS LAB**

**Code: ECS31206**

**Credit: 2**

**Contact Hours: 2**

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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| **DATABASE MANAGEMENT SYSTEM** | **ECS31108** | **2-1-0** | **3 Credits** |

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| **Module 1**  **Database system architecture:** Data Abstraction, Data Independence, Data Definition and Data Manipulation Languages.  **Data models:** Entity-relationship, network, relational and object oriented data models, integrity constraints and data manipulation operations. | | **[6+6]** |
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| **Module 2:**  **Relational query languages:** Relational algebra, tuple and domain relational calculus, DDL and DML constructs.  **Relational database design:** Domain and data dependency, Armstrong's axioms, normal forms, dependency preservation, lossless design.  **Query processing and optimization:** Evaluation of relational algebra expressions, query equivalence, joins strategies, query optimization algorithms. | | **[14]** |
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| **Module 3:**  **Storage strategies:** Secondary Storage, RAID, Hashing, Indices, B-trees | | **[7]** |
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| **Module 4:**  **Transaction processing:** Concurrency control, ACID property and Serializability of scheduling, locking and timestamp, Database recovery.  **Concurrency and Recovery System:** Locking Techniques, The Two-Phase Locking Protocol, Time stamp ordering, Recovery Techniques | | **[6+6]** |
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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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| **Database Management System Lab** | **ECS31208** | **0-0-2** | **2 Credits** |

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| **Laboratory:** |
| Familiarization of structured query language, Database Schema Design, Database Creation, SQL Programming and Report Generation using a commercial RDBMS like ORACLE/SYBASE/DB2/SQL-Server/INFORMIX. 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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| **OPERATING SYSTEM** | **ECS31110** | **2-1-0** | **3 Credits** |

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| **Module 1:**  **Introduction:**  Introduction to OS, need of OS, types and evolution of OS, Operating System Services, User Operating System Interface, System Calls, Types of System Calls. | | **[8]** |
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| **Module 2:**  **Process:**  Basic Concepts, Operations on Processes, Inter process communication, Process Scheduling: Scheduling Criteria, Scheduling Algorithms. | | **[8]** |
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| **Module 3:**  **Process Co-ordination:**  Process Synchronization: Critical Section, Synchronization Hardware Technique, Semaphores, Problems of Synchronization, Monitors.  Deadlocks: System Model, Mechanism for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. | | **[12]** |
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| **Module 4:**  **Memory Management:**  Memory Management: Swapping, Memory partitions, Contiguous and non-contiguous memory allocation, Paging, Segmentation, Fragmentation.  Virtual Memory: Paging, Page Table, Demand paging, TLBs, Inverted Page Tables, Page Replacement Algorithm. | | **[10]** |
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| **Module 5:**  **Storage Management** :  File System: File Concept, Access Methods, Directory Structure, protection, Implementing File Systems: File System Structure, Directory Implementation, Allocation Methods, Free  Space Management, Efficiency and Performance, Recovery. | | **[7]** |
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| **Text Books:** | |
| 1 | Operating System Principles, 9th Edition, Abraham Silberschatz, Peter Galvin and Greg Gagne, John Wiley |
| 2 | Operating Systems Internal and DESIGN principles , William Stallings |
| **Reference Books:** | |
| 2 | Tanenbaum A.S, “Operating System Design & Implementation”, Practice Hall NJ. |

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| **Operating System Lab** | **ECS31210** | **0-0-2** | **2 Credits** |

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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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| **Mathematics-II** | **SMA31142** | **3-1-0** | **4 Credits** |

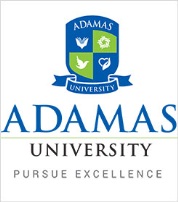
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| **Module 1:**  **Complex Numbers:** Definition, Representation of Complex Numbers, Argand plane, Sum, subtraction, product and division of complex numbers, Magnitude, argument and square root of complex numbers. | | **[6]** |
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| **Module 2:**  **Matrices:** Determinant and its properties, Matrices, Addition and Multiplication of Matrices, Inverse Matrix, Solution of Linear Equations in three variables by Cramer’s Rule, Rank and Inverse of Matrices by Elementary Transformation, System of Linear Equations, Solution by Matrix Inversion Method, Eigen Values & Eigen Vectors, Caley-Hamilton Theorem and related Problems. | | **[4]** |
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| **Module 3:**  **Ordinary Differential Equations:** Introduction to differential equation, Order / Degree of differential equations, solution of first order ordinary differential equations, Linear differential equation, solution of second order differential equation using operator method and its applications. | | **[10]** |
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| **Module 4:**  **Co-ordinate Geometry:** Rectangular axes, distance formulae, section formulae, shifting of origin, slope of a line and angle between two lines, various forms of equations of a line, parallel to axes, point-slope form, slope-intercept form, two-point form, intercepts form and normal form, general equation of a line, circle, related problems. | | **[6]** |
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| **Text Books:** | |
| 1 | B. S. Grewal, Elementary Engineering. Mathematics, Khanna Publishers |
| 2 | Dr. D. C. Sancheti &V. K. Kapoor, Business Mathematics by. S.Chand & Sons Publications. |
| **Reference Books:** | |
| 1 | B. S. Grewal, Higher Engineering. Mathematics, Khanna Publishers |

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| **Managerial Economics** | **HEC31180** | **2-1-0** | **3 Credits** |

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| **Module 1:**  **Introduction to Managerial Economics**  Managerial Decision Making Process- Identifying the Problem, Establishing the objectives under Limited Resources, Opportunity cost, principal- agent problem in business management; Cases | | **[7]** |
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| **Module 2:**  **Decision Making in the Household**  Theory of Demand and its Determination; Violations of the Law of Demand; Shifts and movements along the Demand curve; from Individual to Market Demand; Elasticity of Demand: Price Elasticity, Income Elasticity, Cross Price Elasticity, Substitutes and Complements; Cases; | | **[12]** |
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| **Module 3:**  **Decision Making in the Firm**  Production Function - Short and Long Run; Production with One Variable Input - Total Product, Average and Marginal Products, Law of Variable proportions, Relationship between TP, AP and MP.  Short run Costs of Production, Fixed and Variable Costs, Short Run Total, Average and Marginal Cost and Relationship between them. Short Run Cost Curves, Long run cost Curves, Economies of Scale and Scope; Cases; | | **[14]** |
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| **Module 4:**  Perfect Competition: Characteristics of Perfect Competition, Profit Maximization in Competitive Markets, Output Decision in the Short Run, Shut Down Point,  Short Run Supply for the Firm and Industry; Output Decision in the Long Run, Break Even Point, Long Run Supply for the Perfectly Competitive Industry. | | **[12]** |
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| **Text Books:** | |
| 1 | Principles of Economics. N. G. Mankiw. Cengage Learning (6th or later Edition) |
| 2 | Principles of Economics. Karl E. Case and Ray C. Fair, Pearson (8th Edition) |
| 3 | Microeconomics. R. S. Pindyck, D.L. Rubinfeld, and P.L. Mehta. Pearson, India, 7thedition, 2013 |
| **Reference Books:** | |
| 1 | Managerial Economics: Principles and Worldwide Application. Dominick Salvatore. Oxford; 7th edition (2012) |
| 2 | Managerial Economics: Analysis, Problems, Cases. Truet & Truet. Wiley India Pvt. Ltd.; 8th edition (2011) |
| 3 | Managerial Economics: Theory and Applications. D. M. Mithani. Himalaya Publishing House Pvt. Ltd.; 7th edition (2013) |



**ADAMAS UNIVERSITY**

**Bachelor of Computer Application (BCA)**

**SEMESTER – III**

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| **Probability & Statistics** | **SMA42144** | **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 of group and ungrouped data and their limitations, concept of dispersion, absolute and relative measure of dispersion, range, variance, standard deviation , Coefficient of variation | | **[10]** |
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| **Module 2:**  **Correlation and Regression:** Scatter diagram, Karl-Pearson’s correlation, rank correlation and its uses of correlation in business regression, regression lines, regression coefficients, properties of regression coefficients and related problems. | | **[14]** |
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| **Module 3:**  **Probability theory and Random Variable:** Basic terminologies, classical and axiomatic definition of probability, tree diagrams, conditional probability, mutually exclusive events and independent events, Bayes’ theorem or inverse probability rule and its applications, random variable, discrete and continuous random variables, probability distribution of a random variable, Probability mass function and density function, expectation value, mean and variance of a random variable and theorems on expectation. | | **[8]** |
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| **Module 4:**  **Discrete and continuous probability distributions:** Discrete probability distributions: Binomial distribution, geometrical and Hypergeometric distributions, Poisson distribution, Negative Binomial distribution, continuous probability distribution: uniform, exponential and Normal distributions, Normal approximation to Binomial and Poisson distributions its applications. | | **[8]** |
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| **Text Books:** | |
| 1 | Goon, Gupta and Dasgupta, Fundamentals of Statistics, The world press private ltd., Kolkata. |
| 2 | V Sundarapandian, Probability, Statistics and Queuing Theory, PHI |
| **Reference Books:** | |
| 1 | S.P. Gupta, Statistical Methods, Sultan Chand & Sons |
| 2 | S K Nag, N K Nag, Statistics, Kalyani Publishers |
| 3 | Dipak Chatterjee, Elements of Statistics, Scitech publications. |

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| **E-Commerce & Applications** | **MBA32141** | **3-0-0** | **3 Credits** |

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| **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]** |
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| **Text Books:** | |
| 1 | “ . Kenneth C. Laudon, E-Commerce : Business, Technology, Society, 4th Edition, Pearson |
| 2 | “ S. J. Joseph, E-Commerce: an Indian perspective, PHI |
| **Reference Books:** | |
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| **Data Communication & Computer Network** | **EEC32101** | **3-0-0** | **3 Credits** |

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| **Module 1: Review of Computer Communications Foundations**  Review of Data Transmission Principles, Transmission Components; ASK, PSK, QPSK, QAM, M-ary digital modulation; Data Compression. | | | **[2]** |
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| **Module 2:** **Computer network**  Hosts, Communication Channels, Protocols, Network Topology, Performance of Network, Network Classification, Advantages & Disadvantages of Network, OSI Reference Model, TCP/IP. | | | **[6]** |
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| **Module 3:** **Data Line Devices:**  Modems, DSL, ADSL, Multiplexer and Different Multiplexing Techniques: (FDM, TDM). | | | **[5]** |
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| **Module 4: Physical Layer:**  Guided Transmission, Media, Wireless Transmission Medium, Circuit Switching and Telephone Network, High Speed Digital Access. | | | **[6]** |
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| **Module 5:**  **Data Link Layer:**  Need for Data Link Control, Flow Control & Error Control (Flow control mechanism, Error Detection and Correction techniques) Data Link Layer Protocol. | | | **[7]** |
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| **Module 6:**  **Network Layer:**  Routing, Congestion control, Internetworking principles, Internet Protocols (IPv4 packet format, Hierarchal addressing sub netting, ARP, RARP), Bridges, Routers. | | | **[7]** |
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| **Module 7:**  **Local Area Network:**  Definition of LAN, LAN topologies, Layered architecture of LAN, MAC, IEEE standard. Ethernet LAN, CSMA, CSMA/ CD, Token passing LAN. | | | **[6]** |
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| **Module 8:**  **Network Security:**  Security Requirement, Data encryption strategies, authentication protocols, Firewalls. | | | **[6]** |

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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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| **Computer Network Lab** | **ECS32201** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| 1. Familiarization with Networking Components and devices: LAN Adapters, Hubs, Switches, Routers etc. 2. Familiarization with Transmission media and Tools: Co-axial cable, UTP Cable, Crimping Tool, Connectors etc. 3. To configure the IP address for a computer connected to LAN and to configure network parameters of a web browser for the same computer. 4. To develop programs for implementing / simulating routing algorithms for Ad hoc networks. 5. To install any one open source packet capture software like wire shark etc. 6. NIC Installation & Configuration (Windows/Linux) 7. Configure a Network topology using packet tracer software. 8. Implementation and study of stop and wait protocol 9. Implementation and study of Go back-N and selective repeat protocols 10. Implementation of Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check) 11. Implement the data link layer framing methods such as character, character stuffing and bit stuffing. 12. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm 13. Implementation of Data encryption and decryption 14. TCP/UDP Socket Programming 15. Implementation of a Prototype Multithreaded Server |

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| **Object Oriented Programming** | **ECS32103** | **3-0-0** | **3 Credits** |

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| **Module 1**  **OOP concepts:**  Introduction, Object-Oriented Paradigm, Benefits of OOP, Applications of OOP, Java Evolution, JVM, Byte code, Data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, classes and objects, Procedural and object oriented programming paradigms.  Constants, variables and Data Types, operators, expressions, conditional statements, loops, break and continue statements, arrays, strings, constructors, different types of constructor, static data type and methods, access specifier, this keyword, recursion, garbage collection. | | **[10]** |
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| **Module 2:**  **Inheritance:** Inheritance hierarchies super and sub classes, Member access rules, super keyword, and preventing inheritance: final classes and methods, the Object class and its methods, Method overriding, Dynamic method dispatch.  **Polymorphism :**dynamic binding, method overriding, abstract classes and methods  **Interfaces:**  Introduction of Interface, Interfaces vs. Abstract classes, implementing interfaces, Nested Interfaces, extending interfaces, accessing Interface variables.  **Inner classes:** uses of inner classes, local inner classes, anonymous inner classes, static inner classes.  **Packages:** Basic concept, Creating and Accessing a Package, Finding packages and CLASSPATH, importing packages. | | **[13]** |
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| **Module 3:**  **Exception handling :** Fundamentals of Exception-handling, classification of exceptions- exception hierarchy, checked exceptions and unchecked exceptions, using try and catch, multiple catch clauses, throw, throws and finally, re throwing exceptions, creating own exception sub classes.  **Multithreading :**  java thread model, multiple processes vs multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronization, inter-thread communication. | | **[12]** |
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| **Module 4:**  **Applets -** Inheritance hierarchy for applets, differences between applets and applications, life cycle of an applet, Passing Parameters to applets, applet security issues.  **GUI Programming: AWT** class, Swing, Swing vs AWT, Swing components, Containers, swing applications, Layout management. | | **[10]** |
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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 |

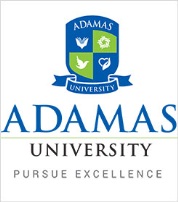
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| **Laboratory:** |
| Programs to demonstrate class and constructor.  Programs to demonstrate overloading.  Programs to demonstrate inheritance, overriding.  Programs to demonstrate wrapper class, arrays.  Programs to demonstrate developing interfaces- 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** | **ECS32203** | **0-0-3** | **2 Credits** |

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

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| **Unit-I**  Introduction to Communication – Communication Model –Types of Communications – Barriers to Communication – Effective means of communication | | **[9]** |
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| **Unit-II**  Reading Skills – Importance of Reading – Types of Reading – Effective reading skills | | **[5]** |
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| **Unit-III**  Listening Skills – Importance of Listening – Types of Listening – Barriers to Listening | | **[5]** |
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| **Unit-IV (Oral Skill I)**  Presentation Skills – Different types of Presentation skills – Non verbal Communications –– Use of Visual aids | | **[9]** |
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| **Unit-V (Oral Skill II)**  Group Discussion, Business Dialogues and Interaction | | **[9]** |
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| **Unit-VI (Oral Skill III)**  Mock Interviews | | **[8]** |
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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. |

**ADAMAS UNIVERSITY**

**Bachelor of Computer Application (BCA)**

**SEMESTER – IV**

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| **Computer Organization & Architecture** | **ECS32102** | **3-1-0** | **4 Credits** |

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| **Module 1:**  **Basic computer Organization:** CPU, memory, input-output subsystems, control unit. Instruction set architecture, registers, Machine cycle, RTL interpretation of instructions, instruction format, addressing modes, instruction set. Case study – instruction sets of some common CPUs.  **Data representation:** signed number, fixed and floating point and character representation. Computer arithmetic: integer addition and subtraction, multiplication using shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic. | | **[12]** |
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| **Module 2:**  **Introduction** to x86 architecture.  **CPU Design:** hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU. Memory hierarchy, Access method, Main memory, associative memory, cache memory, virtual memory, memory organization.  Peripheral devices: I/O interface and I/O driver, 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. | | **[12]** |
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| **Module 3:**  **Pipelining:** Basic Conceptof pipelining, throughput and speedup, pipeline hazards.  Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency. | | **[10]** |
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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. |

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| **Module 1:**  **Computer graphics & graphics systems:** Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures for presentations. Visualization & image processing. RGB color model, direct coding, and lookup table. Storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc. Active & Passive graphics devices.  **Scan conversion:** Points & lines, Line drawing algorithms; DDA algorithm, Bresenham’s line algorithm, Circle generation algorithm, Ellipse generating algorithm, scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm. | | **[12]** |
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| **Module 2:**  **2D transformation & viewing:** Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines. Viewing pipeline, Window to view port co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse. Cohen and Sutherland line clipping, Sutherland-Hodgeman Polygon clipping, Cyrus-beck clipping method  **Three Dimension Geometry:** Introduction, 3D Geometry, Primitives and Transformation, Rotation about an Arbitrary Axis, Parallel Projection, Perspective Projection, Viewing Parameters, and Conversation to View Plan Coordinate, 3D  Viewing Transformation, Special Projection. | | **[16]** |
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| **Module 3:**  **Curves:** Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves.  **Hidden surfaces :** Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Painter’s algorithm, scan-line algorithm; Hidden line elimination, wire frame methods , fractal - geometry. | | **[10]** |
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| **Module 4:**  **Color & shading models:** Light & color model, interpolative shading model, Texture.  **Introduction to Ray-tracing:** Human vision and color, Lighting, Reflection and transmission models. | | **[7]** |

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| **Computer Graphics** | **ECS32104** | **3-0-0** | **3 Credits** |

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| **Text Books:** | |
| **1** | Hearn, Baker – “Computer Graphics (C version 2nd Ed.)” – Pearson education |
| **2** | Z. Xiang, R. Plastock – “ Schaum’s outlines Computer Graphics (2nd Ed.)” – TMH |
| **Reference Books:** | |
| **1** | D. F. Rogers, J. A. Adams – “Mathematical Elements for Computer Graphics (2nd Ed.)” –  TMH |

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| **Web Designing** | **ECS32106** | **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, and 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 Java script, Server-Side Java script, Java script Objects, Java script 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 Java script:** 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 | | **[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 Designing Lab** | **ECS32206** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| Familiarize with programming Language such as HTML, CSS, Java script, XML.  1. Introduction to web page design,attributes and concept.  2. Explain the logic of HTML and its feature, heading, color, backgroundcolor,(h1 to h6).  3. Design a preliminary web page by using HTML table,create,row,header,data insertion.  4. Design a web page by using HTML form tag and explore its features by taking reference of some  E-commerce web site(Mantra ,Zabongetc)  5. Design a web page by using HTML form attributes (Radio button, submitbutton, drop down menu, checkbox etc)  6.Design a List in HTML (Orderedlist and Un-ordered list).  7. Designa event page by using JavaScript.  8-Design a web page by using JavaScript for arithmetic and logical operation. |

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| **Scripting Languages** | **ECS32108** | **3-0-0** | **3 Credits** |

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| **Module 1:**  **Preliminaries of PHP**  PHP installation and Introduction, Loops, String Functions in PHP, PHP Email Function, PHP Basics, Variables, Arrays in PHP with Attributes, Date & Time, Image Uploading, File handling in PHP, Functions in PHP, Errors handling in PHP, Mini project in header and footer | | **[10]** |
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| **Module 2:**  **Advanced PHP**  Class, Object, Inheritance, Object cloning, Constructor, Destructor, Access specifiers, Scope resolution operator, Class constant, ‘this’ operator, Abstract class, Interface, sending e-mails using Classes | | **[10]** |
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| **Module 3:**  **Preliminaries of Perl**  Creation and change of scalar variables, Control structures to branch or loop, Arithmetic operators, Assignment operators, Logical operators, Conditional operator, Range operator, Creation and change of array variables, Creation and change of hash variables, Random number generation, Formatting data, currency, time, eval and pack etc., Reading of files specified on the command line | | **[10]** |
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| **Module 4:**  **Advanced Perl**  Searching files with specific text patterns, Regular expression testing and recognition of backwards referencing ,Mechanism of Perl's powerful regular expression capabilities and its application, Creation of complex data structures which allow multi-dimensional arrays and hashes, dereferencing and referencing operation on complex data structures, File operations (Read and write) and system processes using file handles, Creation and, removal of files and directories, Changing directory and file properties, Creation of Perl subroutines, packages, and modules, Creation of references and object oriented code, Understanding of basic tests, subtests and other testing modules, Debugging of Perl scripts, Partial evaluation operators, Smart matching | | **[15]** |
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| **Text Books:** | |
| 1 | Holzner, Steven. PHP: the complete reference. Tata McGraw-Hill Education, 2007. |
| 2 | Holzner, Steven. Perl Black Book. Coriolis Group Books, 1999. |
| **Reference Books:** | |
| 1 | Lengstorf, Jason, and Thomas Blom Hansen. PHP for absolute beginners. Vol. 1. Apress, 2009. |
| 2 | Sklar, David, and Adam Trachtenberg. PHP cookbook. " O'Reilly Media, Inc.", 2003. |
| 3 | Christiansen, Tom, Larry Wall, and Jon Orwant. Programming Perl: Unmatched power for text processing and scripting. " O'Reilly Media, Inc.", 2012. |
| 4 | Brenner, Steven E., and Edwin Aoki. Introduction to CGI/PERL; Getting Started with Web Scripts. IDG Books Worldwide, Inc., 1995. |

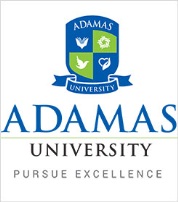
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| **Scripting Language Lab** | **ECS32208** | **0-0-3** | **2 Credits** |

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| **Laboratory:** |
| Suggested assignment to be framed based on PHP and PERL:  1.Creating simple webpage using PHP  2.Use of conditional statements in PHP  3.Use of looping statements in PHP  4.Creating different types of arrays  5.Usage of array functions  6.Creating user defined functions  7.Creation of files  8.File manipulation using PHP  9.Creation of sessions  10.Creation of cookies  11.Creating simple applications using PHP  12.Creating simple table with constraints  13.Insertion, Updation and Deletion of rows in MYSQL tables  14.Searching of data by different criteria  15.Sorting of data  16.Demonstration of joining tables  17.Usage of sub queries  18.Usage of aggregate functions  19.Working with set operators  20.Working with string, numeric and date functions  21.Database connectivity in PHP with MySQL  22.Validating Input  23. Formatting the Output.  25.PERL |

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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** |

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| **References:** | |
| 1 | Engineering Economy, Leland Blank and Anthony Tarquin, McGraw-Hill, New York, 7th Edition |
| 2 | How to Make Cash Flow Projections, Tim Spilker, <https://www.tgci.com/sites/default/files/pdf/How%20to%20Make%20Cash%20Flow%20Projections_0.pdf> |
| 3 | Esty, Benjamin C., Modern Project Finance:  A Casebook, John Wiley & Sons, Inc., (New York, NY). 2003 |
| 4 | Gregory Mankiw, Principles of Economics, South-WesternCollege, 6th Edition |

**ADAMAS UNIVERSITY**

**Bachelor of Computer Application (BCA)**

**SEMESTER – V**

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| **Mobile Computing** | **EEC33101** | **3-0-0** | **3 Credits** |

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| **Module 1: Introduction**: Introduction to mobile computing, basics of digital communication, modulation & switching, Digital vs Analog Communication, AM, PM, FM, ASK, FSK, and PSK. | | **[11]** |
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| **Module 2: Medium Access Techniques & Telecommunication Systems**: Medium Access Control and Multiplexing,. 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. | | **[8]** |
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| **Module 3: Cellular Concept & Portable Device Technology**: Different types of Mobility, channel allocation, Evolution of cellular concepts, interferences, handoffs, Frequency reuse.  Wireless Local Loop (WLL): Introduction to WLL Architecture, wireless Local Loop Technologies. Wireless LAN, Personal Area Network: Bluetooth, Data service in GPRS Application for GPRS, limitation of GPRS, WAP: The Mobile Internet Standard: Overview of WAP. | | **[11]** |
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| **Module 4: Data delivery models in wireless channel**: History of wireless transmission, Wireless transmission, Frequencies, 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 to Vehicular ad hoc networks, Smart phone ad hoc networks, Internet-based mobile ad-hoc networks, & data mining | | **[7]** |

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| **Text Books:** | |
| 1 | Wireless Communications and Networking, Willam Stallings, Pearson Education. (2002) |
| 2 | Wireless Communication: Principles and Practice ,T. Rappaport , Pearson Education. |
| 3 | Introduction to Data Communications & Networking - Behurouz & Forozan Mc Graw Hill. |
| **Reference Books:** | |
| 1 | Reza B'Far (Ed), "Mobile Computing Principles", Cambridge University Press |
| 2 | R. Dayem, "Mobile Data & Wireless Lan Technologies," Prentice-Hall (2005) |

**Course: Mobile Computing Lab(EEC33201)**

**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.

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| **Design and Analysis of Algorithm** | **ECS33101** | **3-0-0** | **3 Credits** |

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| **Module 1:**  **Introduction:** characteristics of an algorithm. Algorithm analysis: Asymptotic analysis of complexity bounds: best, average and worst-case behavior, standard notations. Empirical measurements, time and space complexity. Analyze recursive algorithms Using recurrence relations: – demonstrate using recursive algorithms. | | **[8]** |
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| **Module 2:**  **Algorithmic Strategies:** Brute-Force, Greedy, Branch-and-Bound, Backtracking and Dynamic Programming methodologies: Heuristics: - characteristics and their domains of 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 and 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 Reduction techniques. | | **[8]** |
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| **Module 5:**  **Advanced Topics:** Approximation algorithms, Randomized algorithms, Class of problems beyond NP – PSPACE. | | **[5]** |

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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. |

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| **Programming Paradigm** | **ECS33103** | **3-0-0** | **3 Credits** |

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| **Module 1**  **Object-oriented Philosophy:** Object oriented concept: Objects, classes, Attributes, methods, access specifier, static members, constructors, Encapsulation, data hiding, Inheritance, Overloading, Strong and weak typing. Object oriented System Development lifecycle. | | **[10]** |
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| **Module 2:**  **Object-oriented programming:** inheritance: Inheritance, polymorphism: dynamic binding, final keyword. Abstract classes: Object class, interfaces: object cloning, inner classes.  Event-driven programming: Graphics programming, Frame, Components, working with 2D shapes, Using color, fonts, and images. Basics of event handling, event handlers, adapter classes, actions, mouse events, and AWT event hierarchy: introduction to Swing: Model-View-Controller design pattern, Swing Components, buttons, layout management. | | **[13]** |
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| **Module 3:**  **Generic programming:** Overview for generic programming: generic classes, generic methods, generic code and virtual machine, inheritance and generics, reflection and generics, Exceptions: exception Hierarchy, throwing and catching exceptions: Stack Trace Elements, assertions, logging | | **[12]** |
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| **Module 4:**  **Concurrent programming:** Multi-threaded programming: interrupting threads, thread states, thread properties. Thread synchronization, thread-safe Collections. | | **[10]** |

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| **Text Books:** | |
| 1 | Cay S. Horstmann and Gary Cornell, “Core Java: Volume I – Fundamentals”, Eighth Edition, Sun Microsystems Press, 2008. |
| **Reference Books:** | |
| 1 | John J. Donovan “Systems Programming”, Tata McGraw-Hill Edition, 2000. |
| 3 | D. M. Dhamdhere, “Systems Programming and Operating Systems”, Second Revised Edition, Tata McGraw-Hill, 2000. |

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| **Laboratory:** |
| Suggested assignments to be framed based on the following topics:   Imperative paradigm   Functional paradigm   Logic paradigm   Concurrent Programming   Functional Programming |

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| **Programming Paradigm Lab** | **ECS33203** | **0-0-3** | **2 Credits** |

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| **Management Information System** | **MBA33141** | **3-0-0** | **3 Credits** |

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| **Module 1**  Introduction to MIS, Function of MIS, Problems with MIS, and Knowledge requirements for MIS (7 areas), General system concept, DSS, EIS, ES, 4GL, IT & MIS: What is IT? Is computer essential for MIS? - Office supporting system(Whole) - Computer and MIS - Computer & MIS Data Processing System - Characteristics of DPS - Scope of Trans. Processing - Example of Sales Processing. | | **[8]** |
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| **Module 2:**  Information, Data & Communication – Concepts, Classification of Information, Characteristics of Information - Communication System, Communication methods, Information in an organization, Case Study  Planning and Planning terms, Objectives, Problems, Type, Source of Planning Information System Concepts - Structure elements - Objectives & types Tools of planning, Introduction to Pert-CPM , | | **[14]** |
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| **Module 3:**  Working with people Model of Organization behavior, Social System & organization culture - Case Study - Industry - Academic - Employee Vs Employer - Employee Vs Organization, Industrial Behavior, formal and informal relationship, Job satisfaction, Change its resistance & management. | | **[12]** |
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| **Module 4:**  Concept of controlling management, Control cycle, Different Feedback loops, Principles of controlling, Multiple control feedback, Scope of management control - Total Quality Management, Case Study – TQM. | | **[11]** |

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| **Text Books:** | |
| 1 | Management Information System : by T. Lucey, 8th Edition BPB Publication |
| **Reference Books:** | |
| 1 | Organizational & Management : By Agarwal, Tata McGraw Hill Publishing Company Ltd |
| 3 | . MIS – By W.S. Jawadekar, Tata McGraw Hill Publishing Company Ltd. |

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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** |

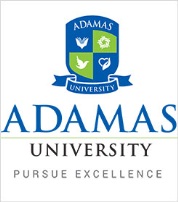
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| **Text Books:** | |
| 1 | B.K Banerjee, Financial Accounting- Concept, Analysis, Methods and Uses, P.H.I Learning Pvt. Ltd |
| 2 | Basu and Das, Financial Accounting(vol-1), - Rabindra library |
| 3 | Prof. Amitabh Basu, Financial Accounting(vol-1), Tee Dee publication pvt.ltd |

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| **Seminar** | **ECS33301** | **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** | **ECS33401** | **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**

**Bachelor of Computer Application (BCA)**

**SEMESTER – VI**

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| **Module 1:**  **Introduction** **to AI**: Definition of AI, Goals of AI, AI approaches, AI Techniques, Branches of AI, Application of AI, Agents, Problem formulation, uninformed search strategies, heuristics : informed search strategies , constraint satisfaction | | **[8]** |
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| **Module 2:**  Logical agents, propositional logic, inferences, forward chaining: backward chaining, unification, resolution. | | **[8]** |
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| **Module 3:**  Planning with state-space search , partial-order planning, planning graphs, planning and acting in the real world | | **[10]** |
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| **Module 4:**  Uncertainty, review of probability, Bayesian networks, Temporal models. | | **[9]** |
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| **Module 5:**  Learning: learning from observations, Types of Learning, Inductive learning, Statistical Learning, Reinforcement Learning, and Explanation based Learning, Decision trees, Neural Network. | | **[10]** |

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| **Introduction to Artificial Intelligence** | **ECS33102** | **3-0-0** | **3 Credits** |

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| **Text Books:** |
| Artificial Intelligence – A Modern Approach, Second Edition, S. Russel and P. Norvig Pearson Education, 2003. |
| **Reference Books:** |
| Computational Intelligence: a logical approach”, David Poole, Alan Mack worth, Randy Goebel, First edition; Oxford University Press, 2004. |
| Artificial Intelligence: Structures and Strategies for complex problem solving”, Fourth Edition, G. Luger, Pearson Education, 2002. |

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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** | **ECS33402** | **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** | **ECS33502** | **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. |