



Management Institute of Technology (MIT) Hyderabad

Affiliated with University of Sindh Jamshoro

Course Title:	Discrete Structure
Course Code:	ITEC 418-419
Degree Program:	BS(Information Technology) P-II (2nd semester)
Course rating:	3 credit hours (Theory)
Pre-requisites:	Data Structure and Algorithms

Course Objectives:

Introduces the foundations of discrete mathematics as they apply to Computer Science, focusing on providing a solid theoretical foundation for further work. Further, this course aims to develop understanding and appreciation of the finite nature inherent in most Computer Science problems and structures through study of combinatorial reasoning, abstract algebra, iterative procedures, predicate calculus, tree and graph structures.

Syllabus Outline:

The Foundations: Logic and Proofs, Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

Basic Structures: Sets, Functions, Sequences and Sums, Set Operations and Summations.

The Fundamentals: Algorithms, the Integers, Matrices, The Growth of Functions, Complexity of Algorithms, The Integers and Division, Primes and Greatest Common Divisors and Applications of Number Theory.

Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms and Program Correctness.

Counting: The Basics of Counting, The Pigeonhole Principle, Permutations & combinations, Binomial Coefficients, Generalized Permutations and Combinations, Generating Permutations and Combinations.

Discrete Probability: An Introduction to Discrete Probability, Probability Theory, Bayes' Theorem, Expected Value and Variance.

Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.

Relations: Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations and Partial Orderings.

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs and Graph Coloring.

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, and Minimum Spanning Trees.

Boolean algebra: Boolean Functions, Representing Boolean Functions, Logic Gates and Minimization of Circuits.

Learning Material/References:

- * **Discrete Mathematics and Its Applications, 5th edition; by Rosen; McGraw-Hill.**
- * **Discrete Mathematics by Richard Johnsonbaugh, Prentice Hall,.**
- * **Discrete Mathematical Structures, 4th Edition, by Kolman, Busby & Ross, 2000.**



Management Institute of Technology (MIT) Hyderabad

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Course Title:	Computer Organization and Assembly Language
Course Code:	ITEC 420-421
Degree Program:	BS(Information Technology) P-II (2nd semester)
Course rating:	3 credit hours (Theory)
Pre-requisites:	Digital Logic & Computer Architecture

Course Objectives:

The main objective of this course is to introduce the organization of computer systems and usage of assembly language for optimization and control. Emphasis should be given to expose the low-level logic employed for problem solving while using assembly language as a tool.

Syllabus Outline:

Basic Concepts: Introduction to Assembly Language, Virtual Machine Concept, Data Representation and Boolean Operations.

Machine Architecture: General Concepts, IA-32 Processor Architecture, IA-32 Memory Management, Components of an IA-32 Microcomputer and Input-Output System.

Assembly Language Fundamentals: Basic Elements of Assembly Language, Assembling, Linking, and Running Programs, Defining Data, Symbolic Constants and Real-Address Mode Programming.

Data Transfers, Addressing, and Arithmetic: Data Transfer Instructions, Addition and Subtraction, Data-Related Operators and Directives, Indirect Addressing, JMP and LOOP Instructions.

Procedures: Linking to an External Library, Link Library, Stack Operations, Defining and Using Procedures and Program Design Using Procedures.

Conditional Processing: Boolean and Comparison Instructions, Conditional Jumps, Conditional Loop Instructions, Conditional Structures, Finite State Machines (Application) and Using the .IF Directive.

Integer Arithmetic: Shift and Rotate Instructions, Shift and Rotate Applications, Multiplication and Division Instructions, Extended Addition and Subtraction, ASCII and Packed Decimal Arithmetic.

Advanced Procedures: Local Variables, Stack Parameters, Stack Frames, Recursion, and Creating Multi-Module Programs.

Strings and Arrays: String Primitive Instructions, Selected String Routines, Two-Dimensional Arrays, Searching and Sorting Integer Arrays.

Structures and Macros: Structures, Macros, Conditional-Assembly Directives and Defining Repeat Blocks.

32-Bit Windows Programming: Win32 Console Programming, Writing a Graphical Windows Application and IA-32 Memory Management.

High-Level Language Interface: Introduction, Inline Assembly Code and Linking to C++ Programs.

Learning Material/References:

* **Assembly Language for Intel-Based Computer, 4th Edition, 1999, by Kip R. Irvine.**

* **Assembly Language Programming and Organization of the IBM PC by Ytha Yu and Charles Marut**



Management Institute of Technology (MIT) Hyderabad

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Course Title:	Information Systems
Course Code:	ITEC-628
Degree Program:	BS(Information Technology) P-II (2nd semester)
Course rating:	2 credit hours (Theory)
Pre-requisites:	None

Course Objectives:

To equip the students with the knowledge of Data Processing and Computer Based Data Processing environments.

Syllabus Outline:

Computer-Based Management Information Systems: Components of MIS and their integration for managerial control and decision support, analysis, design, and implementation of MIS software

Computer System Analysis and Design: Treatment of the life cycle of an MIS with emphasis on information requirements analysis, feasibility studies, economics, system design equipment, selection, and implementation process.

Managerial Applications of Microcomputers: Selection and use of microcomputer hardware and software management for applications, word processing, spreadsheet, analysis, graphics communications, file management and database management.

Business Data Communications & applications: Business data communications, integration of data communication into the automated business office, emphasis on the use and application of expert Systems and natural languages processing in business and public sectors.

Knowledge Based System Development: Essential steps in knowledge engineering, management, development, evaluation & maintenance of knowledge-based systems, research and analysis of selected problems & topics in information resource management.

Learning Material/References:

* **Information Systems Development, Paul Lewis, Pitman Publishing.**



Management Institute of Technology (MIT) Hyderabad

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Course Title:	System Analysis and Design
Course Code:	ITEC- 424
Degree Program:	BS(Information Technology) P-II (2nd semester)
Course rating:	3 credit hours (Theory)
Pre-requisites:	None

Course Objectives:

The course has been designed to provide a solid foundation of systems principles and understandings of how business function, while heightening students to the issues analysts face daily. This course also covers the concepts, skills, methodologies, techniques, tools and perspectives essential for system analysts to successfully develop information systems.

Syllabus Outline:

Introduction: System definition and concepts, Characteristics and types of system, Manual and automated systems, Real-life Business sub-systems, Production, Marketing, Personal, Material, Finance, Types of models, Systems environment and boundaries.

Systems analyst: Role and need of systems analyst, Qualifications and responsibilities, Systems Analyst as and agent of change.

System Development Life Cycle: Introduction to SDLC, Various phases of development, Analysis, Design, Development, Implementation, Maintenance, Systems documentation considerations, Principles of systems documentation, Types of documentation and their importance.

System Planning: Data & fact gathering techniques: Interviews, Group communication, Presentations, Site visits, Feasibility study, Types of feasibility reports, System selection plan & proposal, Prototyping, Cost-Benefit analysis, Tools & techniques.

Systems Design and modeling: Process modeling, Logical and physical design, Design representation, Systems flowcharts and structured charts, DFD, Common diagramming conventions and guidelines using DFD and ERD diagrams, Data Modeling & systems analysis, designing the internals, Program and Process design.

Input and Output: Classification of forms, Input/output forms design, User-interface design, Graphical interfaces.

Modular and structured design: Module specifications, Module coupling and cohesion, Top-down and bottom-up design.

System Implementation / Maintenance: Planning considerations, Conversion methods, producers & controls, System acceptance Criteria, System evaluation & performance, Testing and validation, Systems qualify Control and assurance, Maintenance activities.

System Audit and Security: Data and Strong media, Procedures and norms for utilization of computer equipment, Audit of computer system usage, Audit trails, Types of threats to computer system and control measures, Threat to computer system and control measures, Disaster recovery and contingency planning.

Object Oriented Analysis and design: Introduction to Object Oriented Analysis and design life cycle, object modeling: Class Diagrams, Dynamic modeling, state diagram, sequence diagramming.



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Learning Material/References:

* **System Analysis and Design** Elias M. Award, Galgotia Publication.

* **Modern Systems Analysis and Design, 2nd Edition** by Jaffery A. Hoffer, Joe. F. George, Joseph S. Valacich

Course Title: Probability and Statistics
Course Code: ITEC-426
Degree Program: BS(Information Technology) P-II (2nd semester)
Course rating: 3 credit hours (Theory)
Pre-requisites: None

Course Objectives:

To introduce the concept of statistics, randomness and probability and build on these concepts to develop tools and techniques to work with random variables

Syllabus Outline:

Fundamental concepts: Probability and random variables, Interpretation of probability, Probability as a relative frequency, Subjective probability, Probability density functions, Functions of random variables, Expectation values, Error propagation, Orthogonal transformation of random variables.

Probability functions: Binomial and multinomial distributions, Poisson distribution, Uniform distribution, Exponential distribution, Gaussian distribution, Log-normal distribution, Chi-square distribution, Cauchy (Breit--Wigner) distribution, Landau distribution.

Statistical tests: Hypotheses, test statistics, significance level, power, An example with particle selection, Choice of the critical region using the Neyman--Pearson lemma, Constructing a test statistic, Linear test statistics, the Fisher discriminant function, Nonlinear test statistics, Selection of input variables, Goodness-of-fit tests, The significance of an observed signal.

Parameter estimation: Samples, estimators, bias, Estimators for mean, variance, covariance.

Maximum likelihood: ML estimators, Extended maximum likelihood, Maximum likelihood with binned data, Combining measurements with maximum likelihood, Relationship between ML and Bayesian estimators 93.

Statistical errors, confidence intervals and limits: The standard deviation as statistical error, Classical confidence intervals (exact method), Limits near a physical boundary

Learning Material/References:

* **Introduction to Statistics**, Walpole, 1982 Prentice Hall, ISBN: 0024241504.

* **Statistical Data Analysis**, G. Cowan G, 1998, Clarendon, Oxford.

* **Advances in Statistical Analysis and Statistical Computing III** Mariano R (Ed.), (1993), JAI Press, Greenwich, Conn.



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Course Title:	Computer Graphics
Course Code:	ITEC 612-613
Degree Program:	BS(Information Technology) P-II (2nd semester)
Course rating:	2 credit hours (Theory)
Pre-requisites:	Programming Fundamentals

Course Objectives:

Introduction to Computer Graphics; display memory; generation of points, vectors, shapes, objects, etc.; raster and geometric graphics; interactive and passive graphics; graphics peripherals; analog and digital images and analog/digital conversion; mathematics of 2-D and 3-D transformations; applications in animation, computer aided design and instruction; hypertext and multimedia; dialog design; user-interface.

Syllabus Outline:

Overview of the graphics process: Computer Graphics Basics, Applications of graphics, Interactive graphics programming, graph plotting, windows and clipping, and segmentation.

Graphics hardware: Output Devices, Input Devices, Processing Devices.

Fundamental algorithms: Line Drawing Algorithms, Programming raster display systems, panning and zooming, Raster algorithms and software, scan-Converting lines, characters and circles, Region filling and clipping, rendering, shading, colour and animation.

2D and 3D geometric transformations: Scaling, Rotation, other basic transformations.

Two dimensional viewing: viewing pipeline, clipping, and windowing.

Three dimensional viewing: viewing pipeline, viewing parameters, projections, viewing transformations, clipping, visible surface detection, 3D to 2D projections and camera transformation

Parametric curves and surfaces: Bezier, B-Spline, Curve and surface design.

Introduction to illumination models and surface rendering

Animation techniques: tweening, double buffering, scene graph manipulation.

Learning Material/References:

- * **Computer Graphics, Principles and Practice, J. D. Foley, A. van Dam, S. K. Feiner and J. F. Hughes, Addison-Wesley**
- * **Computer Graphics, F.S.Hill, Maxwell MacMillan**
- * **Computer Graphics with OpenGL, 3rd Edition, Hearn and Baker, Pearson Prentice Hall**



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