



AKU B.E./B.Tech IT Sem 3 syllabus

Discrete Mathematics

PCC-IT301 Discrete Mathematics

4 Credits

Module 1:

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

Module 2:

Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination.

Module 3:

Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. **Proof Techniques:** Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

Module 4:

Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and

Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

Module 5:

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Coloring, Coloring maps and Planar Graphs, Coloring Vertices, Coloring Edges, List Coloring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

Suggested books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw -Hill
2. Susanna S. Epp, Discrete Mathematics with Applications, 4th edition, Wadsworth Publishing Co. Inc.
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw -Hill.

Suggested reference books:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's Application to Computer Science", TMG Edition, Tata McGraw-Hill
2. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press. Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson,
3. Discrete Mathematics, Tata McGraw -Hill

Data Structure & Algorithms

PCC-IT302 Data Structure & Algorithms

5 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.

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 Type of Queues: Algorithms and their analysis.

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.

Module 4

Searching, Sorting and Hashing: Linear Search and Binary Search Techniques and their complexity analysis. 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.

Module 5

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.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Suggested 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.
3. “Fundamentals of Data Structures”, Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.

Digital Electronics

ESC 401 Digital Electronics

5 Credits

Module 1

Fundamentals of Digital Systems and logic families: Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital ICs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri - state logic.

Module 2

Combinational Digital Circuits: Standard representation for logic functions K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, DeMultiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

Module 3

Sequential circuits and systems: A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K-T and D types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

Module 4

A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2RLadder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using Voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs.

Module 5

Semiconductor memories and Programmable logic devices:

Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory (RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

Suggested books:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

Object Oriented Programming using C++

PCC-IT303 Object Oriented Programming using C++

5 credits

Module 1

Introduction to C++ : Object Oriented Technology, Advantages of OOP, Input- output in C++, Tokens, Keywords, Identifiers, Data Types C++, Derives data types. The void data type, Type Modifiers, Typecasting, Constant, Operator, Precedence of Operators, Strings.

Module 2

Control Structures and Functions: Decision making statements like if-else, Nested if-else, goto, break, continue, switch case, Loop statement like for loop, nested for loop, while loop, do-while loop. Parts of Function, User- defined Functions, Value- Returning Functions, void Functions, Value Parameters, Function overloading, Virtual Functions.

Module 3

Classes and Data Abstraction : Structure in C++, Class, Build- in Operations on Classes, Assignment Operator and Classes, Class Scope, Reference parameters and Class Objects (Variables), Member functions, Accessor and Mutator Functions, Constructors, default Constructor, Destructors.

Module 4

Overloading, Templates and Inheritance: Operator Overloading, Function Overloading, Function Templates, Class Templates. Single and Multiple Inheritance, virtual Base class, Abstract Class, Pointer and Inheritance, Overloading Member Function.

Module 5

Pointers, Arrays and Exception Handling: Void Pointers, Pointer to Class, Pointer to Object, Void Pointer, Arrays. The keywords try, throw and catch. Creating own Exception Classes, Exception Handling Techniques (Terminate the Program, Fix the Error and Continue, Log the Error and Continue), Stack Unwinding.

Suggested books:

1. Thinking in C++, Volume 1 & 2 by Bruce Eckel, Chuck Allison, Pearson Education
2. Mastering C++, 1/e by Venugopal, Tata McGraw Hill.
3. Object Oriented Programming with C++, 3/e by E. Balaguruswamy, Tata McGraw Hill.
4. Starting Out with Object Oriented Programming in C++, by Tony Gaddis, Wiley India.

Suggested Reference Books:

1. The C++ Programming language 3/e by Bjarne Stroustrup, Pearson Education.
2. C++, How to Programme, 4e, by Deitel, Pearson Education.
3. Big C++ by Cay Horstmann, Wiley India.
4. C++ Primer, 3e by Stanley B. Lippmann, JoseeLajoie, Pearson Education.
5. C++ and Object Oriented Programming Paradigm, 2e by Debasish Jana, PHI.
6. Programming with C++, 2/e by Ravichandran, Tata McGraw Hill.
7. C++ Programming Black Book by Steven Holzner, Dreamtech Press.

Mathematics-III (Differential Calculus)

BSC 301 Mathematics-III (Differential Calculus)

2 credits

Module 1

Successive Differentiation, Leibnitz's Theorem. Limit, Continuity and Differentiability of function for one variable.

Module 2

Limit, Continuity and Differentiability of function for several variables. Partial Derivatives, Euler's Theorem for Homogeneous functions, Total derivatives, Change of Variables. Maxima and Minima of Several Variables. Methods of Lagrange Multipliers. Taylor's and Maclaurin's Theorem with remainders of several variables.

Module 3

Vector Calculus: Gradient, Divergence and Curl of a Vector and their Physical Interpretations, Vector Identities. Directional Derivatives. Line, Surface and Volume integrals, Application of Green's, Stokes and Gauss Divergence Theorem (Without Proof).

Module 4

First Order Ordinary Differential Equations: Exact, Linear and Bernoulli's Equations, Euler's Equations, Equations not of First Degree: Equations Solvable for P, Equations Solvable for Y, Equations Solvable for X and Clairaut's Type.

Module 5

Ordinary Differential Equations of Higher Orders: Second Order Linear Differential Equations with Variable Coefficients, Method of Variation of Parameters, Cauchy-Euler Equation; Power Series Solutions; Legendre Polynomials, Bessel Functions of the First Kind and their properties.

Module 6

Partial Differential Equations - First Order: First Order Partial Differential Equations, Solutions of First Order Linear and Non-Linear PDEs.

Technical Writing

HSMC 301 Technical Writing

3 credits

Module 1

Introduction: Fundamentals of Technical Writing: Need for Clear and Concise Technical Writing, Attributes of Technical Writing, Types of Technical Writing, Benefits of Technical Writing, Technical, Managerial and General Readers, Expressing versus Impressing, Correct use of Noun, Pronoun, Verb, Adjective, Adverbs, Tense and

Punctuation.

Module 2

Performing Technical Studies: Types of Technical Studies, General Methodology- Proposing a Project, Gathering Background Information, Designing Test Plans, Performing Experiments, Reporting Results. **Writing Strategy:** Analysis of Readers, Scope of Writing, Purpose and Objective. **Document Options:** Document Hierarchy, Report Types and Selection. **Criteria for Good Technical Writing:** Technical Content, Presentation, Language Skills. **Writing Style:** Elements of Style, Examples of Writing Styles, Recommended Style, Learn to Prepare Effective Illustrations

Module 3

Formal Reports: The Outline and Introduction (Outline, Title, Front Matter, Writing the Introduction), Writing the Body (Writing a Procedure, Describing Machines/Processes, Writing Test Results, Writing the Discussion Section), Closure (Conclusions, Recommendations, References, Abstract, Back Matter, Report Distribution, Saving Reports). **Informal Reports:** Elements of an Informal Report, Investigation Reports, Service Work, Action Letters and Proposals. Typical Memo Reports.

Module 4

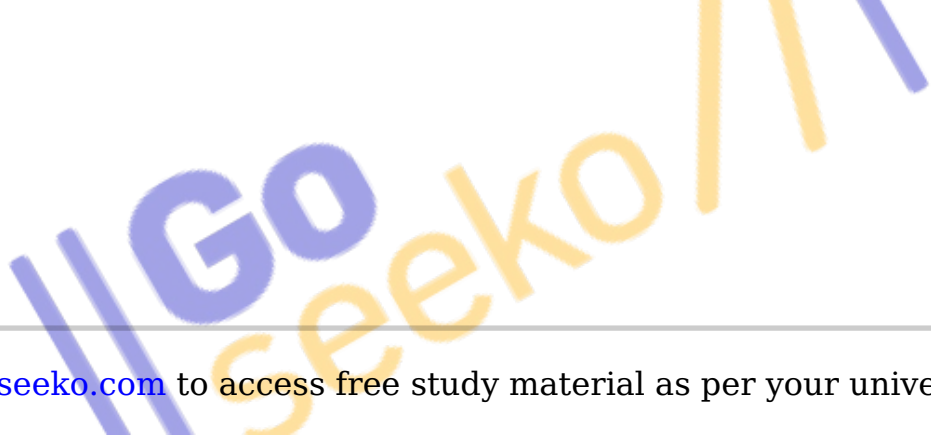
Review and Editing: Types of Review and Edit, Review and Editing Methodology, Examples of Reviews. **Oral Presentations:** Types of Oral Presentations, Preparation, Visual Aids, Impediments to Technical Writing, Maintaining Writing Skills, Measuring Report Results.

Suggested books:

1. "Engineers' Guide to Technical Writing", Kenneth G. Budinski, ASM International.
2. "Handbook for Technical Writing", James H. Shelton, NTC Contemporary Press
3. "The Technical Writer's Handbook: Writing With Style and Clarity", Matt Young, University Science Books

Suggested reference books:

1. "A Guide to Technical Writing", T. A. Rickard, Franklin Classics.
2. "Technical Writing", S. Jayprakash, Himalaya Publishing House Pvt. Ltd.
3. "Technical Writing", O. N. Pandey.



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