

Kumaun University, Nainital, Uttarakhand

BACHELOR OF COMPUTER APPLICATION

Session 2019-2020

BCA 211- Discrete Mathematics

Unit I

Propositional Logic: Propositions, Logical connectives, Compound propositions, Conditional and biconditional propositions, Truth tables, Tautologies and contradictions, Contrapositive, Logical equivalences and implications, DeMorgan's Laws, Normal forms, Principal conjunctive and disjunctive normal forms, Rules of inference, Arguments, Validity of arguments.

Unit II

Predicate Calculus: Predicates, Statement function, Variables, Free and bound variables, Quantifiers, Universe of discourse, Logical equivalences and implications for quantified statements, Theory of inference, The rules of universal specification and generalization, Validity of arguments.

Unit III

Set Theory: Basic concepts, Notations, Subset, Algebra of sets, The power set, Ordered pairs and Cartesian product, Relations on sets, Types of relations and their properties, Relational matrix and the graph of a relation, Partitions, Equivalence relations, Partial ordering, Poset, Hasse diagram, Lattices and their properties, Sublattices, Boolean algebra, Homomorphism.

Unit IV

Functions: Definitions of functions, Classification of functions, Type of functions, Examples, Composition of functions, Inverse functions, Binary and n-ary operations, Characteristic function of a set, Hashing functions, Recursive functions, Permutation functions.

Unit V

Groups: Algebraic systems, Definitions, Examples, Properties, Semigroups, Monoids, Homomorphism, Sub semigroups and Submonoids, Cosets and Lagrange's theorem, Normal subgroups, Normal algebraic system with two binary operations, Codes and group codes, Basic notions of error correction, Error recovery in group codes.

Recommended Books:

1. Trembly J.P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw-Hill Pub. Co. Ltd,
2. Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Fourth Edition, Pearson Education Asia,

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BCA 212: Introduction to C++

UNIT I:

Procedural vs. Object oriented programming, The main function, C++ preprocessors and the <iostream.h> file, C++ input and output with cin and cout. Simple variables, naming simple variables, Integer types, Floating types, Operators, Operator precedence and associativity, Type conversion, symbolic constants, Derived data types, Arrays, strings, structure, reference variables, new and delete operators. Relational expression in C++, relational operators, for loop, while loop, do-while loop, if-else statement, logical operators, conditional operators, switch statements, break and continue statements.

UNIT II:

Defining a function, function prototyping and function calls, function arguments, passing by reference, inline functions, default arguments.

UNIT III:

Defining classes, implementing member functions, class constructor and destructor, this pointer, friend function, examples based on class and object problems. Base classes, derived classes, implementing and using derived classes, virtual base class, types of inheritance. Problem based on multiple inheritance

UNIT IV:

Stream classes, output with ostream class methods, input with cin, introduction with file handling. Memory Leak, Memory Leak Prevention, Smart pointers, unique_ptr.

UNIT V:

Standard Template Library: STL containers containing vectors, list, queue, map, set, hash_map, hash_set. STL algorithms functions: Sorting Algorithms functions: sort, partial_sort. Searching Algorithms functions: binary_search, lower_bound, upper_bound, equal_range. Non-Modifying Algorithms: count, equal, mismatch, search, search_n. Modifying Algorithms functions: copy, copy_n, fill, fill_n, move, transform, generate etc

Recommended Books:

1. E.Balagurusamy: Object oriented programming with C++
2. K.R.Venugopal: Mastering C++
3. Bjarne Stroustrup: The C++ programming language.

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BCA 213: Data Structure

UNIT I

Introduction: Basic Terminology, Data type, Data object, Need of Data Structure, Types of Data Structure, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off.

UNIT II

Arrays, Single and Multidimensional Arrays, address calculation, application of arrays, Linked list: Representation and implementation of Singly Linked Lists, Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to and from Linked Lists, Doubly linked list.

UNIT III

Stacks: Array and linked representation and implementation of stack, Operations on Stacks: Push & Pop, Applications of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack. Recursion: Introduction, recursion in C, example of recursion, recursive functions. Queues: Array and linked representation and implementation of queues, Operations on Queue: Create, Insert, Delete, Full and Empty. Circular queue, Deques, and Priority Queues.

UNIT IV

Trees: Basic terminology, Binary Trees, Binary tree representation, algebraic expressions, Complete Binary Tree., Traversing Binary trees, Binary Search Tree, searching BST, insertion and deletion in BST. Graph: Basic terminology, Traversal: BFS, DFS. Spanning Tree: Prims, Kruskal Algorithm, Dijkstra's Algorithm.

UNIT V

Searching- Sequential search, binary search. Sorting algorithms with efficiency- Bubble sort, Insertion sort, Merge sort, Quick Sort, Selection Sort

Recommended Books:

1. Data Structures- Seymour Lipschutz
2. Data Structures using C and C++- Tanenbaum

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BCA 214: Digital Electronics

Unit I

Fundamental concepts: Digital Computer and Digital Systems, Binary Numbers, Number Base Conversion, Complements, Binary Codes.

Unit II

Boolean algebra and logic gates: Basic Theorem and Properties of Boolean Algebra, Boolean functions, Canonical and standard forms. Digital logic gates, Simplification of Boolean functions: two and three variable Maps, four variable maps. POS simplification, NAND and NOR Implementation, don't care conditions.

Unit III

Combinational Logic Design: Design procedure, Adders, Subtractors, Code conversion, Binary Parallel adder, Decimal adder, Magnitude Comparator, Decoder, Encoder, Multiplexers, De-Multiplexers, Parity generation and checking.

Unit IV

Sequential Logic Design: Flip-flops: Basic flip-flop, RS, JK, D, T, Triggering of flip-flops, Analysis of clocked sequential circuits, state reduction and assignment, flip-flop excitation tables

Unit V

Registers, Counters and the Memory unit Registers, shift registers, Counters, Asynchronous and synchronous counters, Ripple counters. Memory-RAM, ROM, Programmable logic array (PLA).

Recommended Books:

1. "Modern Digital Electronics" - R.P. Jain
2. Digital logic and Computer design- M. Morris Mano