SYLLABUS

FOR

Post Graduate Diploma in Computer Application (PGDCA) Programme

HIMALAYAN GARHWAL UNIVERSITY

Post Graduate Diploma in Computer Application (PGDCA)

Programme Structure

SEMESTER - I

PGDCA01	:	Computers and Information Technology
PGDCA02	:	Programming and Problem Solving in 'C'
PGDCA03	:	Mathematical Foundation of Computer Science
PGDCA04	:	System Analysis and Design
PGDCAP05	:	Computers and Information Technology
PGDCAP06	:	Programming and Problem Solving in 'C'

SEMESTER - II

PGDCA07	:	Software Engineering
PGDCA08	:	Data and File Structure
PGDCA09	:	Object Oriented Programming Using C++
PGDCA10	:	Combinatorics and Graph Theory
PGDCAP11	:	Data Structure Using „C"

FIRST SEMESTER:

Subject Code	Subject	Instructional Hrs/Week			Marks			Credit
		L	T	P	ESA	CA	Sub Total	
Theory								
PGDCA01	Computers and Information Technology	2	-	-	70	30	100	2
PGDCA02	Programming and Problem Solving in 'C'	3	-	-	70	30	100	3
PGDCA03	Mathematical Foundation of Computer Science	3	-	-	70	30	100	3
PGDCA04	System Analysis and Design	2	1	-	70	30	100	3
Practical								
PGDCAP05	Computers and Information Technology	-	-	6	70	30	100	2
PGDCAP06	Programming and Problem Solving in 'C'	-	-	6	70	30	100	2
Total		**10**	**1**	**12**	**420**	**180**	**600**	**15**

ESA: End Semester Assessment CA : Continuous Assessment Sub. Total : Subject Total

SECOND SEMESTER:

Subject Code	Subject	Instructional Hrs/Week			Marks			Credit
		L	T	P	ESA	CA	Sub Total	
Theory								
PGDCA07	Software Engineering	2	-	-	70	30	100	2
PGDCA08	Data and File Structure	3	-	-	70	30	100	3
PGDCA09	Object Oriented Programming Using C++	3	-	-	70	30	100	3
PGDCA10	Combinatorics and Graph Theory	2	1	-	70	30	100	3
Practical								
PGDCAP11	Data Structure Using „C"	-	-	6	70	30	100	2
	Total	**10**	**1**	**6**	**350**	**150**	**500**	**13**

ESA : End Semester Assessment
CA : Continuous Assessment
Sub. Total : Subject Total

PGDCA01: Computers and Information Technology

Computer Basics: Introduction, Typical Model of Computer, Classification and Characteristic of Computer, Computer generations, Description of Computer hardware components. Primary and secondary storage devices and their functions. Input and Output device and their functions. Comparison based analysis of various hardware components, Types of software.

Basic Operating System Concepts: Functional knowledge of MS-DOS, WINDOWS, UNIX operating systems. Introduction to Basic Internal/ External Commands of DOS, Basic UNIX command and vi editor. Managing file and directories in various operating Systems.

Computer and Information System in Business: Computer application in business, project Management, Computers in Personal and Administration, Accounting Information System, Computer Application in Purchasing, Material Management, Production Planning and Control.

MS-Office: Proficiency in performing functions in Microsoft WORD, Excel, Power Point, Access and Front Page,

Internet: Introduction to internet and WWW, Web browsers, Search engines, Intranet, Extranet and Electronic mail.

IT Technologies: Electronic/ Mobile Commerce, Hypermedia, Data warehouses and Data marts, Data mining, On-Line Analytical Processing (OLAP).

References:

1. Fundamental of Information Technology : Alexis Leon, Leon Vikas Publication.
2. Fundamentals of Computers : V. Rajaraman, PHI.
3. Computers Today: Suresh K. Basandra, Galgotia Publication.
4. Exploring UNIX : Stephen
5. Learning DOS : R. Bangia, Khanna Book Publication.
6. Internet: An Introduction: Manish Dixit, TMH.
7. Internet for everyone : Mathews Leon , Lean Techworld.

PGDCA02: Programming and Problem Solving in 'C'

Basic Programming Concepts: Introduction to the basic ideas of problem solving and programming using principles of top-down modular design, Flowcharts, Abstraction Mechanisms, Stepwise Refinement.

Introduction to Programming Language C: Data Types, Instruction and its Types, Storage Classes, C character set, Identifiers and keywords, Data types, Declarations, Expressions, statements and symbolic constants, #include, define, if def. Preparing and running a complete C program.

Operators and expressions: Arithmetic, unary, logical, bit-wise, assignment and conditional operators, Library functions, Control statements: while, do-while, for statements, nested loops. If-else, switch, break, continue and go to statements, comma operator.

Functions: Defining and accessing: passing arguments, Function prototypes, Recursion, Use of library functions.
Storage classes: automatic, external and static variables.
Arrays: Defining and processing, passing to a function, Multi dimensional arrays. Strings: Operations on strings.

Pointers: Declarations, Passing to a function, Operations on pointers, Pointers and arrays, Arrays of pointers.
Structures: Defining and processing, passing to a function, Unions.
Data files: Open, close, create, process, Unformatted data files.

References:

1. Hutchison, R. : "Programming in C". McGraw Hill.
2. Johnsonbaugh R. and Kalin M. : "Applications Programming in C". PHI.
3. Rajaraman, V.:"Computer Programming in C". Prentice Hall of India.
4. D. Richi : C Programming. Prentice Hall of India.

PGDCA03: Mathematical Foundation of Computer Science

Relation: Type and compositions of relations, Pictorial representation of relations, Equivalence relations, Partial ordering relation.
Function: Types, Composition of function, Recursively defined function.

Mathematical Induction: Piano's axioms, Mathematical Induction, Discrete Numeric Functions and Generating functions, Simple Recurrence relation with constant coefficients, Linear recurrence relation without constant coefficients, Asymptotic Behaviour of functions

Algebric Structures: Properties, Semi group, monoid, Group, Abelian group, properties of group, Subgroup, Cyclic group, Cosets, Permutation groups, Homomorphism, Isomorphism and Automorphism of groups.

Calculus: Functions, limits and Continuity, differentiation and Integration, Differential Equations.
Linear equations and Matrices: Row/column operations, Gaussian Elimination, Decomposition, inverse.
Determinant: Properties of determinants, Cramer"s Rule, determinants to transpose and inverse.

Vector spaces: Linear independence, Bases, subspace and dimensionality.
Inner Products and Norms: Length, angle, direction cosines; Orthogonalization.
Prepositional Logic: Preposition, First order logic, Basic logical operations, Tautologies, Contradictions, Algebra of Proposition, Logical implication, Logical equivalence, Normal forms, Inference Theory, Predicates and quantifiers, Posets, Hasse Diagram.

References:

1. Liptschutz, Seymour, "Discrete Mathematics", TMH.
2. Trembley, J.P. and R. Manohar, "Discrete mathematical Structure with Application to Computer Science", TMH.
3. Kenneth H. Rosen, "Discrete Mathematics and its applications', TMH.
4. Doerr Alan and Levasseur Kenneth, "Applied Discrete Structure for Computer Science, Galgotia Pub. Pvt. Ltd.
5. Gersting "Mathematical Structure for Computer Science", WH freeman and Macmillan
6. Korthage, R.R.: Discrete Computational Structures, Academic Press.
7. C.L.Liu "Elements of Discrete Maehmatics", McGraw Hill.
8. Peter Grossman, "Discrete Mathematics for Computer", Palgrave Macmillian.

PGDCA04: System Analysis and Design

System Concepts and Information System Environment: The System Concept, Definition, Characteristics of Systems, Elements of a System, Open and Closed and closed system, Formal and Informal Information Systems, Computer based Information Systems, Management Information System, Decision Support System, General Business Knowledge, and Interpersonal Communicational System.

The System Development Life Cycle: Recognition of needs, Impetus for System Change, Feasibility Study, Analysis, Design, Implementation, Post implementation and Maintenance.

The Role of the Systems Analyst: Historical Perspective, Academic and Personal Qualifications, the multifaceted role of the Analyst, The Analyst/User Interface, Behavioral issues.

Systems Planning and Initial Investigation: Strategies for Determining Information Requirement, Problem Definition and Project initiation, Background Analysis, Fact Analysis, Review of Written Documents, Onsite Observations, Interviews and Questionnaires, Fact Analysis, Performance Analysis, Efficiency Analysis, Service Analysis.

Information Gathering: Kind of Information needed. Information about the firms, Information gathering tools, the art of Interviewing, Arranging the Interview, Guides to Successful Interview, Types of Interviews and Questionnaires, The Structured and Unstructured Alternatives.

The Tools of Structured Analysis: The Dataflow Diagram (DFD), Data Dictionary, Decision Trees and Structured English.

Feasibility Study: System performance, Economic Feasibility, Technical Feasibility, Behavioral Feasibility, Steps in Feasibility Analysis.

Input/Output and Forms Design: Input Design, CRT Screen Design, Output Design, Requirements form Design.

References:

1. Elias M.Awad, "Systems Analysis and Design" Galgotia Publication
2. Hoffer, "Modern Systems Analysis and Design" Addision Wesley
3. Kendall, "Introduction to System Analysis and Desogm", McGraw Hill
4. System Analysis and Design Handbook: V. K. Jain, Wiley dreamtech

PGDCA07: Software Engineering

Introduction: Introduction to software engineering, Importance of software, evolving role of software, Software Characteristics, Software Components, Software Applications, Software Crisis, Software engineering problems, Software Development Life Cycle, Software Process.

Software Requirement Specification: Analysis, Principles, Water Fall Model, The Incremental Model, Prototyping, Spiral Model, Role of management in software development, Role of matrices and Measurement, Problem Analysis, Requirement specification, Monitoring and Control.

Software-Design: Design principles, problem partitioning, abstraction, top down and bottom up-design, Structured approach functional versus object oriented approach, design specifications and verification, Monitoring and control, Cohesiveness, coupling, Forth generation techniques, Functional independence, Software Architecture, Transaction and Transaction and Transform Mapping, Component level Design, Forth Generation Techniques. Coding: Top-Down and Bottom-Up programming, structured programming, information hiding, programming style and internal documentation.

Testing principles, Levels of testing, functional testing, structural testing, test plane, test case specification, reliability assessment, software testing strategies, Verification and validation, Unit testing, Integration Testing, Alpha and Beta testing, system testing and debugging.

Software Project Management: The Management spectrum (The people, the product, the process, the project) Cost estimation, project scheduling, staffing, software configuration management, Structured Vs. Unstructured maintenance, quality assurance, project monitoring, risk management.

Software Reliability and Quality Assurance: Reliability issues, Reliability metrics, Reliability growth modeling, Software quality, ISO 9000 Certification for software industry, SEI capability maturity model, comparison between ISO and SEI CMM. CASE (Computer Aided Software Engineering): CASE and its scope, CASE support in software life cycle, documentation, project management, internal interface, Reverse Software Engineering, Architecture of CASE environment.

References:

1. Pressman, Roger S., "Software Engineering: A Practitioner's Approach Ed. oston: McGraw Hill
2. Jalote, Pankaj, "Software Engineering Ed.2"New Delhi: Narosa 2002
3. Schaum's Series, "Software Engineering" TMH
4. Ghezzi Carlo and Others "Fundamentals of Software Engineering" PHI
5. Alexis, Leon and Mathews Leon, "Fundamental of Software Engg.
6. Sommerville, Ian, "Software Engineering" AWL
7. Fairly, "Software Engineering" New Delhi" TMH
8. Pfleerger, S. "Software Engineering" Macmillan, 1987
9. Software Testing Tools: Dr. Prasad, Wiley dreamtech India Pvt. Ltd.

PGDCA08: Data and File Structure

Introduction: Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off. Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Ordered list, Sparse Matrices, and Vector. Stacks: Array Representation and Implementation of stack, Operations and Stacks: Push and POP, Array Representation of Stack, Linked Representation of stack, Operations Associated with Stacks, Application of stack, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack. Recursion: Recursive definition and processes, recursion in C, example of recursion, Tower of Hanoi Problem.

Queues: Array and linked representation and implementation of queues, Operations on Queue; Create, Add, Delete, Full and Empty, Circular queue, Dequeue, and Priority Queue. Link List: Representation and implementation of Singly linked lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List of Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.

Trees: Basic terminology, Binary Tree, Binary tree representation algebraic Expressions, Complete Binary Tree, Extended Binary Tree, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees. Traversing Threaded Binary tree, Huffman algorithm. Searching and Hashing: Sequential search, comparison and analysis, Hash Table, Hash Function, Collection Resolution Strategies, Hash Table Implementation.

Sorting: Insertion Sort, Bubble sorting, Quick Sort, Two way Merge Sort, Heap Sort, Sorting on Different Keys, Practical Consideration for Internal Sorting. Binary Search Trees, AVL Tree, B-trees.

File Structures: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices.

References:

1. Horowitz and Sahani, "Fundamentals of data Structures" Galgotia
2. R. Kruse etal, "Data Structures and Program Design in C" Person Education
3. A.M. Tenenbaum etal, "Data Structures and Program Design in C" Person Education
4. Lipschutz, "Data Structure", TMH
5. K Loudon, "Mastering Algorithms With C", Shroff Publishers and Distributors
6. Bruno R Preiss, "Data Structure and Algorithms with Object Oriented Design Pattern in C++, Jhon Wiley and Sons, Inc.
7. Adm Frozdek, "Data Structures and Algorithms in C++" Thomson Asia
8. Pal G. Sorenson, "An Introduction to Data Structures with Application", TMH
9. C and Data Structure: Desh Pandey, Wiley dreamtech India Pvt. Ltd.
10. Data Structures- Principles and Fundamental : Keogh Davidson, Wiley dreamtech

PGDCA09: Object Oriented Programming Using C++

Introduction: Introduction to OOP, Basic Concepts of OOP, Applications of OOP. Introduction to C++, Introduction to C++ stream I/O, declarations in C++, Creating New data types in C++, function Prototypes, Inline functions, Reference Parameters, Const Qualifier, Dynamic memory allocation, default arguments, Unary Scope resolution operator, Linkage specifications.

Class, Constructors, Friend Class : Introduction, Comparing class with Structure, Class Scope, Accessing Members of a class, Constructor, Destructor, Const objects, Const member functions, Friend class, Friend function, This pointer, Data abstraction and Information hiding, container classes and Iterators.

Overloading and Inheritance: Operator Overloading, Fundamentals, Restrictions, Overloading stream, Insertion and stream extraction operators, Overloading unary and binary operators, Converting between types, Overloading ++ and --. Inheritance, Introduction, Protected members, Casting base _class pointers to derived _class pointers Overloading Base class members in a Derived class, Public, Protocols and Private inheritance, Direct base classes and Indirect Base Classes, Using Constructors and Destructors in Derived classes, Implicit Derived class object to base class object conversion.

Virtual Functions : Introduction, Type fields and switch statements, Virtual functions, Abstract base classes and concrete classes, Polymorphism, Dynamic binding, Virtual destructors.

C++ Stream I/O : Streams, Stream Input, Stream Output, Unformatted I/O, Stream manipulators, Stream format states, Stream error, States.

Files : File Operations –File pointers – error Handling during file Operations Templates Handling: Templates, Function templates, Class templates, Overloading template functions, Class template and non type parameters, Templates with Multiple parameters.

Exception Handling: Exception handling, Basic of C++ exception, Catching an exception, re-throwing an exception, exception specifications.

References:

1. Deitel H.M. and Deitel P.J. – "How to Program C++" – PHI – 2003
2. Al stevenes – "C++ Programming" – Wiley dreamtech – 2003.
3. Herbert Scheldt, "Complete Reference".
4. Starting out with OOPS in C++ : Tony Gaddis, Wiley dreamtech India Pvt. Ltd.
5. E. Balagurusamy "Object Oriented Programming with C++".
6. Yashwant Kanetkar, "Let Us C++".
7. C++ Programming by Herbert Scheldt – 2004.

PGDCA10: Combinatorics and Graph Theory

Rules of sum and products, Permutation, Combination, Permutation groups and application, Probability, Remsey Theory, Discrete numeric function and generating function, combinatorial problems, Difference equation.

Recurrence Relation: Introduction, Linear recurrence relation with constant coefficient, Homogeneous solution, Particular solution, Total solution, Solution by the method of generating function.

Graphs, sub-graphs, some basic properties, Walks, Path and circuits, Connected graphs, Disconnected graphs and component, Eular and Hamiltonian graphs, Various operation on graphs, Tree and fundamental circuits, Distance diameters, Radius and pendent vertices, Rooted and binary trees, Counting trees, Spanning trees, Finding all spanning trees of a graph and a weighted graph.

Cut-sets and cut vertices, some basic properties, All cut sets in a graph, Fundamental circuit and cut sets, Connectivity and seperatability, Network flows, Planner graphs, Combinatorial and geometric dual, Kuratowski to graph detection of planarity, Geometric dual, Some more criterion of planarity, Thickness and Crossings, Vector space of a graph and vectors, basis vectors, cut set vector, circuit vector, circuit and cut set verses sub spaces, orthogonal vector and sub space. Indicidence matrix and adjacency matrix of graphs.

Coloring and covering partitioning of graph, Chromatic number, Chromatic partitioning, Chromatic polynomials, Matching, covering, Four color problem, Directed graph, Types of directed graphs, Directed paths and connectedness, Euler digraph, Tree and directed edges, Fundamental circuit in digraph, Matrices A,B,C of digraph adjacency matrix of digraph, Enumeration and its types, counting of labeled and unlabeled trees, Polya's theorem, Graph enumeration with polyas theorem, Graph theoretic algorithm.

References:

1. Deo Narsing, :Graph Theory with applications to engineering and computer science", PHI
2. Tremblay and Manohar, :Discrete mathematical structures with applications to computer Science:, TMH
3. Joshi K.D., "Fundamental of discrete mathematics:, New Age International
4. John Truss, "Discrete mathematics of computer scientist"
5. C.L. Liu, "Discrete mathematics"