



# Uttar Pradesh Rajarshi Tandon Open University

*Near Rapid Action Force Campus, Shantipuram Rd, Shantipuram, Phaphamau,  
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## Syllabus

for

## Post Graduate Diploma In Computer Application (PGDCA)

(THE NEW COURSE STRUCTURE AND SYLLABUS WILL BE EFFECTIVE FROM THE ACADEMIC SESSION JULY 2015-16. THEREFORE THOSE STUDENTS WHO WILL BE ENROLLED/ADMITTED IN FIRST YEAR FROM SESSION JULY 2015-16 & ONWARDS WILL STUDY ACCORDING TO THIS NEW SYLLABUS AND THE STUDENTS ADMITTED BEFORE JULY 2015-16 WILL FOLLOW OLD SYLLABUS.)

November 2016

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# 1

## Post Graduate Diploma In Computer Application (PGDCA)

### 1.1 Course Details and Structure

#### कम्प्यूटर अनुप्रयोग में स्नातकोत्तर डिप्लोमा (पी.जी.डी.सी.ए.)

#### Post Graduate Diploma in Computer Application (PGDCA)

कार्यक्रम कोड / Programme Code	: 501	कार्यक्रम अवधि (वर्षों में)	: न्यूनतम : 1 अधिकतम 3
कार्यक्रम माध्यम / Medium of Instruction	: English/अंग्रेजी	Programme Duration (in Yrs.)	: Minimum : 1 Maximum 3
प्रवेश हेतु न्यूनतम अर्हता / Minimum Qualification for Admission	: स्नातक (3 वर्षीय) / एवं इंटरमीडिएट गणित विषय के साथ या छः माह का कम्प्यूटर कोर्स। : Three years Bachelor Degree with maths at 10+2 or Six months Computer Course	कार्यक्रम शुल्क / Programme Fee	: 15000/-
		अभिन्यास कार्य / Assignment Work	: आवश्यक / Essential

#### Course Code and Details

Semester	Paper No.	Course Code	Title of the Course	Credits
1st Semester	603	PGDCA-1.1	Discrete Mathematics	4
	604	PGDCA-1.2	Problem Solving and Programming through C	4
	605	PGDCA-1.3	Computer Organization and Assembly Language Programming	4
	606	PGDCA-1.4	System Analysis and Design	4
	607	PGDCA-1.5	Data Communication and Computer Networks	4
	608	PGDCA-1.6	Internet Concepts and webdesigning with lab work.	4
Credits of 1st Semester				24
2nd Semester	609	PGDCA-2.1	Introduction to Database Management system	4
	610	PGDCA-2.2	Object Oriented Technologies and Java Programming	4
	611	PGDCA-2.3	Software Engineering	4
	612	PGDCA-2.4	Operating system Concepts and Networking Management	4
	613	PGDCA-2.5	Lab work based on PGDCA-2.1 and 2.2	4
	614	PGDCA-2.6	Mini Project	4
Credit of 2nd Semester				24
Total Credits				48

### 1.2 PGDCA-1.1 (Discrete Mathematics)

#### Elementary Logic

**Propositional Calculus:** Propositions, Logical Connectives, Logical Equivalence, Logical Quantifiers.

**Methods of Proof:** What is a proof? Different Methods of proof and Direct proof, Indirect proofs), Principle of induction.

**Boolean Algebra and Circuits:** Boolean Algebras, Logic circuits, Boolean Functions.

### **Basic Combinatorics**

**Sets, Relations and Functions:** Introducing Sets, Operations on sets, Relations, Functions.

**Combinatorics – An Introduction:** Multiplication and addition Principles, Permutations (Permutation of objects Not Necessarily distinct, circular permutation), Combinations, Binomial Coefficients, Combinatorial probability.

**Some More Counting Principles:** Pigeonhole principle, Inclusion – Exclusion Principle, Applications of inclusion exclusion.

**Partitions and Distributions:** Integer partitions, Distributions, distinguishable objects into Distinguishable Containers, Distinguishable objects into Indistinguishable containers, Indistinguishable objects into Distinguishable Containers, Indistinguishable objects into Indistinguishable Containers.

## **1.3 PGDCA-1.2 (Problem Solving and Programming)**

### **An Introduction to C**

**Problem solving:** Problem solving Techniques, Design of Algorithms, Analysis of Algorithm efficiency, Analysis of Algorithm Complexity, Flowcharts,

**Basics of C:** History of C, Salient features of C, Structure of a C Program, Compiling a C Program, Link and Run the C Program, Diagrammatic Representation of Program execution process.

**Variables and Constants:** Character set, Identifiers of Keywords, Data types and storage, Data type Qualifiers, Variables, Declaring variables, Constants, Symbolic Constants.

**Expressions and Operators:** Assignment Statement, Arithmetic operators, Relational Operators, Logical operators, Comma and Conditional Operators, Type Cast operator, Size of Operator, C shorthand, priority of operators,

### **Control Statements, Arrays and Functions**

**Decision and Loop Control Statements:** The if statement, the switch statement, the while loop, The do... while Loop, The for loop, The Nested Loops, The goto statement, The break statement, The continue statement.

**Arrays:** Array Declaration, Initialization, Subscript, Multi- dimensional Arrays.

**Strings:** Declaration and Initialization of Strings, Display of Strings, using different formatting Techniques, Arrays of Strings, Built in String functions and Applications

**Functions:** Definition of a function, Declaration of a function, Function prototypes, the return statement, Types of variables and storage classes, Types of function invoking, Call by value, Recursion.

### **Structures, Pointers and File Handling**

**Structures and Unions:** Declaration of Structures, Accessing the Members of a structure, Initializing structures, Structures as function Arguments, Structures and Arrays, unions.

**DPointers:** Pointers and their characteristics, the address and Indirection operators, Pointer type Declaration and Assignment, Pointer Arithmetic, Passing Pointers to functions, Arrays and pointers, Arrays of Pointers, Pointers and strings.

**The C Preprocessor:** # define to implement Constants # define to create, functional Macros, conditional selection of Code using # if def. Predefined Names Defined by pre- processors, Macros vs. Functions.

**Files:** File Handling in C using File pointers, Input and output using file pointers, string Input/Output Functions, Formatted Input/Output Functions, Block Input/Output Functions, Sequential vs. Random Access Files, Positioning the file Pointer, the buffered I/O – The UNIX like file routines.

## 1.4 PGDCA-1.3 (Computer Organization And Assembly Language Programming)

### Introduction to Digital Circuits

**The Basic Computer:** The Von Neumann Architecture, Instruction Execution, Instruction Cycle, Computers: Then and Now. Data Representation Number Systems, Decimal Representation in Computers, Alphanumeric Representation, Data Representation for Computation. Principles of Logic Circuits I Logic Gates, Logic Circuits, Combinational circuit (Address, Decoders, Encoders, ROM) Principles of Logic Circuits – II Sequential Circuits (Definition) Flip Flops (Basic Flip- Flops, Excitation Tables, Master slave Flip-Flop, Edge-Triggered Flip-Flops), Sequential circuit Design (Registers, Counters Asynchronous Counters, synchronous counters, RAM) Design of a sample counter.

### Basic Computer Organization

**The Memory System:** The Memory Hierarchy RAM, ROM, DRAM, FLASH Memory Secondary Memory and characteristics, Raid and its Levels, The concepts of High speed Memories, virtual memory, SIMM, DIMM. The input /Output System Input/output Devices, The input/output Interface, The Device Controllers and its structure, Device Drivers, Input – Output Techniques, Input Output Processors,

### External Communication Interfaces

**Secondary Storage Techniques:** Secondary Storage Systems, Hard Drives, Removable Storage options. The I/O Technology: Keyboard, Mouse, Video Cards, Monitors (Cathode Ray Tubes, DPI, Interlacing, Bandwidth, Liquid Crystal Displays, Digital Camera, Sound Cards, Printers, Modems, Scanners, Power Supply. The Central Processing Unit Instruction Set Architecture Instruction set characteristics, Instruction set Design Considerations, Addressing Scheme (Immediate Addressing, Direct Addressing, Indirect Addressing, Register Addressing, Register Indirect Addressing, Indexed Addressing Scheme, Base Register Addressing, Relative Addressing Scheme, Stack Addressing), Instruction set and Format Design issues (MIPS 2000, Instruction Format). Registers Micro-Operations and Instruction Execution Basic CPU Structure, Register Organization, General Registers in a processor, Micro-operation Concepts,

### Instruction Executions, Instruction Pipelining

**ALU Organization:** ALU Organization, Arithmetic Processors,

**The Control Unit:** The Control unit, the Hardwired Control, Wilkes Control, The Micro-programmed Control, The Micro instructions, The Execution of Micro Program Reduced Instruction set Computer Architecture Instruction to RISC, RISC Architecture, The use of Large register file, Comments on RISC, RISC pipelining.

### **Assembly Language Programming**

**Microprocessor Architecture:** Microcomputer Architectures, Structure of 8086 CPU, Register set of 8086, Instruction set of 8086, Addressing modes.

**Introduction to Assembly Language Programming:** The Need and use of the Assembly language, Assembly program , Execution, An Assembly program and its components, Input output in Assembly program, The types of Assembly programs.

**Assembly language programming (Part-I):** Simple Assembly programs, Programming with Loops and Comparisons, programming for Arithmetic and String operations.

**Assembly language programming (Part-II):** Use of Arrays in Assembly, Modular Programming, Interfacing, Assembly language Routines to High level language programs, Interrupts, Device Drivers in Assembly.

## **1.5 PGDCA-1.4 (Systems Analysis And Design)**

### **Introduction to Systems Development**

**Introduction to SAD:** Fundamentals of Systems, Real Time Systems, Distributed Systems, Development of a successful System, various Approaches for Development of information systems (Model Driven, Accelerated approach, Joint Application Development).

**System Analyst – A profession:** Needs Systems Analysts, users, Analysts in various functional Areas (Systems Analyst in Traditional Business, Systems Analyst in Modern Business), Role of a Systems Analyst, Duties of a Systems Analysts, Qualification of a Systems Analyst.

**Process of System Development:** Systems Development Life Cycle, Phases of SDLC, Products of SDLC Phases, Approaches to Development (Prototyping, Joint Application Design, Participatory Design ), Case Study (College Library).

**Introduction to documentation of Systems:** Concepts and process of Documentation, Types of Documentation, Different Standards for Documentation, Documentation and Quality of Software.

### **Planning and Designing Systems**

**Process of Systems Planning:** Fact Finding Techniques, Need for fact finding, Issues involved in Feasibility Study, Cost Benefit Analysis, Preparing Schedule, Gathering Requirements of System.

**Modular and Structured Design:** Design principles (Top Down Design, Bottom up Design), Structure Charts, Modularity (Goals of Design, Coupling, Cohesion).

**System Design and Modeling:** Logical and Physical Design, Process Modelling, Data Modeling (ER Diagram), Process specification Tools (Decision Tables, Decision Trees, Structured English Notation), Data Dictionary.

### **More Design Issues and Case Tools**

**Forms and Reports Design:** Forms, Reports, Differences between forms and Reports, Process of Designing Forms and Reports, Deliverables and outcomes, Design specifications, Types

of Information, General formatting Guidelines, Guidelines for Displaying Contents, Criteria for form Design, Criteria for Report Design.

**Physical file Design and Database Design:** Introduction to Database Design, Design of Database fields, Design of Physical Records, Design of Physical Files, Design of Database, Case Study (Employee database),

**Case Tools for Systems Development:** Use of Case Tools by Organizations, Advantages and Disadvantages of CASE Tools, Components of CASE, Types of CASE tools, classification of CASE Tools, Reverse and Forward Engineering, Visual and Emerging Case tools.

### **Implementation and Security of Systems & MIS**

**Implementation and Maintenance of Systems:** Implementation of Systems, Maintenance of Systems.

**Audit and Security of Computer Systems:** Definition of Audit, Audit of Transactions on computer, Computer Assisted Audit Techniques, Computer System and Security Issues, Concurrent Audit Techniques.

**Management Information Systems:** Role of MIS in an organization, Different kinds of information systems, Expert Systems.

## **1.6 PGDCA-1.5 (Data Communication and Computer Networks)**

### **Introduction to data Communication and computer network concepts**

**Introduction to computer Networks:** Network Goals and Motivations, classification of Networks, Network topology, Application of Network, Networking model, Network Architecture, ARPANET, Types of Networks, Advantages of Networks.

**Data Transmission:**Data communication Terminology, Models of Data Transmission, Analog and Digital data transmission, Transmission Impairments, Transmission Media and its Characteristics, wireless transmission, wireless LAN.

**Data Encoding and Communication Technique:**Encoding, Analog-to- Analog Modulation, Analog to Digital Modulation, Digital to Analog Modulation, Digital to Digital Encoding.

**Multiplexing and Switching:**Multiplexing, Digital Subscriber lines, ADSL Vs. CABLE, Switching.

### **Media Access Central and Data Link Layer**

**Data Link Layer Fundamentals:** Framing, Basics of Error Detection, Forward error Correction, cyclic redundancy check Codes for error detection, Flow Control.

**Retransmission Strategies:**Stop & wait ARQ, GO-BACK ARQ, Selective Repeat ARQ pipelining, piggybacking.

**Contention – Based Media Access Protocols:**Advantages of Multiple Access sharing of channel Resources, Pure Aloha, Slotted Aloha, CSMA, CSMA/CD, Ethernet frame format (IEEE 802.3).

**Wireless LAN and Data link layer switching:**Introduction to wireless LAN, wireless LAN architecture (IEEE 802.11), Hidden station and Exposed Station problems, wireless LAN protocols : MACA and MACAW, IEEE 802.11 protocol stack, switching at Data link layer.

## Network layer

**Introduction to layer functionality and Design issues:** Connection oriented vs. connectionless services, Implementation of the network layer services, comparison between virtual circuit and Datagram subnet, Addressing, concept of Congestion, Routing concept.

**Routing Algorithms:**Flooding, shortest path routing algorithm, Distance vector routing, Link state routing, Link state routing, Hierarchical routing, Broadcast routing, Multicast routing.

**Congestion Control in Public Switched Network:**Reasons for congestion in the network, congestion control vs. flow control, congestion prevention mechanism, General principles of congestion prevention mechanism, General principles Congestion control, open loop control, congestion control in Packet-switched Network.

**Internetworking:**Internetworking, Network layer protocols, ICMP, OSPF, BGP.

## Transport Layer and Application Layer Services

**Transport Services and Mechanism:** Transport services, Elements of transport layer protocols.

**TCP/UDP:**Services provided by internet transport protocols, Introduction to (UDP, TCP), TCP segment header TCP connection establishment, TCP connection Termination, TCP Flow control, TCP Congestion control, Remote procedure call.

**Network Security-I – :**Cryptography, Symmetric key cryptography, public key cryptography, Mathematical background.

**Network Security-II:**Digital Signatures, Management of public Keys, Communication Security, Web Security.

## 1.7 PGDCA-2.1 (Introduction to Database Management Systems)

### The Database Management System Concepts

**Basic Concepts:** Need for a database Management System, The logical DBMS Architecture, Physical DBMS Architecture, Commercial Database Architecture, Data Models.

**Relational AND E-R Models:**The Relational Model, Relational Constraints, Relational Algebra, Entity Relationship (ER) Model, E-R diagram, Conversion of ER diagram to Relational database.

**Database integrity and Normalization:** Relational Database integrity, Redundancy and Associated problems, Single – valued dependencies, single valued Normalization, desirable properties of decomposition, Rules of Data Normalization.

**File organization in DBMS:** Physical Database Design issues, storage of database on Hard disks, file organization and its types, types of indexes, Index and tree structure, Multi-key file organization, Importance of file organization on database.

### Structured Query language and transaction Mgt

#### The Structured Query language:

SQL Data Definition language, DML, Data control, Database objects : Views sequences, Indexes and synonyms, table Handling, Nested Queries.



**Transactions and Concurrency Management:** The transactions, the concurrent transactions, the locking protocol, Deadlock and its prevention, optimistic concurrency control.

**Database Recovery and Security:** Recovery, Recovery Techniques, Security and Integrity, Authorization.

**Distributed and Client Server Databases:** Need for Distribution Database Systems, Structure of distributed Database, Advantages and Disadvantages of DDBMS, Design of Distributed database, client server Database.

**Application Development:** Development of A Hospital Management System, Needs to Develop HMS, Creating a database for HMS, Developing Front and forms, Reports, using Queries and Record set.

**Study Centre Management System: A Case Study**

**Introduction :** Introduction to Software, Software Development process: Analysis, System Designing, Software Development, Testing and Maintenance.

## 1.8 PGDCA-2.2 (Object oriented Technologies and Java Programming)

### Object Oriented Technology and Java

**Object – Oriented Methodology-1:** Paradigms of Programming languages, Evolution of OO Methodology, Basic Concepts of OO Approach, Comparison of object oriented and procedure – oriented Approaches, Benefits of OOPS, Applications of OOPS.

**Object – oriented Methodology -2:**Classes and objects, Abstraction and Encapsulation, Inheritance, Method overriding and Polymorphism.

**Java Language Basics:**Introduction to Java, Primitive Data Type and Variables, Java Operators.

**Expressions Statements and Arrays:** Expressions, Statements, Control Statements, Selection Statements, Iterative Statements, Jump statements, Arrays.

### Object oriented concepts and Exceptions Handling

**Class and objects:** Class Fundamentals, Introducing Methods, this Keyword, Using objects as Parameters, Method overloading, Garbage collection, the finalize () Method.

**Inheritance and Polymorphism:**Inheritance Basics, Access, Multilevel, inheritance, Method overriding Abstract classes, Polymorphism, Final Keyword.

**Packages and interfaces:**Package, Accessibility of Packages, using Package members, Interfaces, Implementing interfaces, interface and Abstract classes, Extends and Implements together.

**Exceptions Handling:**Exception, Handling of Exception, Types of Exceptions, Throwing, Exceptions, writing Exception subclasses.

### Multithreading, I/O, and Strings Handling

**Multithreaded Programming:** Multithreading, The Main thread, JAVA Thread Model, Thread Priorities, Synchronization in JAVA, Inter thread Communication.

**I/O In Java:**I/O Basics, Streams and stream, Classes, the predefined streams, Reading from and writing to console, reading and writing files, the transient and volatile Modifiers, using instance of Native Methods.

**Strings and Characters** – :Fundamental of Characters and Strings, the String class, String operations, Data Conversion using value of () Methods, Strings Buffer and Methods.

**Exploring Java I/O:** Java I/O classes and interfaces, Stream classes, Text streams, Stream Tokenizer, Serialization, Buffered stream, print stream, Random Access file.

### **Graphics and user interfaces**

**Applets:** The applet class, Applet architecture, An applet Skeleton: Initialization and Termination, Handling events, HTML Applet TAG.

**Graphics and user interfaces:**Graphics contests and Graphics objects, user interface components, Building user interface with AWT, Swing – Based GUI, Layouts and layouts and layout Manager, Container.

**Networking Features:**Socket overview, Reserved parts and proxy servers, Internet Addressing: Domain Naming Services (DNS), Java and The Net: URL, TCP/IP Sockets, Datagrams.

**Advance Java:**Java database connectivity, an overview of RMI Application, Java Servlets, Java Beans.

## **1.9 PGDCA-2.3 (Software Engineering)**

### **Software Engineering Concepts**

**Introduction to Software Product, and Characteristics:** Component Software Engineering Phases, Documentation of the Software product, Software process and Models (Software Life Cycle, Requirements analysis and specification, Design and Specification, Coding and module testing).

**Software Process Management:** Software Process Management, Human Resource Management, The software team (DD, CD, CC), Organization, information and Decision, Problem Identification, Software crisis, Role of a System Analyst.

**Project Planning and Control:** Project planning and control, Project Scheduling, Project Standards, Project outsourcing.

**Risk Management Concepts:** Introduction and Risk Management Concepts (Managing Risk, Typical Management Risks in software Engineering. Technical Planning, Project Tracking, Delivery Timings, Partial Recovery, Bench mark Testing.

### **Software Quality Concepts and Case Tools**

**Software Performance:** Customer Friendliness, Software Reliability, Software Reviews, Software upgradation, Software tools and environment, Software Libraries and Toolkits, Software Modules, Reapplication of Software modules, Development tools (Code Generators, Debuggers),

**Quality Concepts:** Important Qualities of Software product and process (correctness, Reliability, Robustness, user Friendliness verifiability, Maintainability, Reusability, Portability, Data Abstraction, Modularity), Principles of Software Engineering.

**Software Methodology an Object oriented concepts:** The Evolving role of Software, An Industry perspective , structured Methodologies, Major influencing factors (Evolution of End user computing, Emergence of CASE tools, use of Prototyping and 4GL tools, Relational Database, Object Oriented Programming), using the Methodology, Choosing the Right Methodology, Implementing a Methodology, Current Generation of Software Development tools, Considerations in Application Development.

**CASE Tools:** Software crisis, An Engineering Approach to Software, CASE tools, factors Affecting Software Development, The Benefits of using CASE.

## 1.10 PGDCA-2.4 Operating System Fundamentals and Networking

### Operating System Fundamentals and Networking

**Graphical User Interface:** Evolution of Human and Machine interaction, Common Graphical User interfaces, Functionality of GUI, GUI Design Consideration : Psychological Factors, GUI Design Consideration, Standards.

**Introduction to operating System:** Evolution of operating systems, operating system structure, classification of Advanced operating systems, characteristics of Modern operating system.

**Introduction to Networking Concept:** Networks, the topologies, characteristics of the OSI Layers, OSI Model and communication Between Systems, Interaction Between OSI Model Layers, Protocols, Types of Networks, Medium, Dataflow, Physical Connection, Transmission media Connecting devices.

**Internetworking: Concept, Architecture and protocols:** History of Internetworking, Packet Switching, Internetworking concepts, Internet Addresses, Configuring IP Addresses, TCP/IP, Additional TCP/IP Related protocols, Application layer protocols, www, Domain Name System SNMP and UDP.

### Linux Operating System

**Introduction to Linux operating System:** Features of Linux, Draw Backs of Linux, Components of Linux.

**Linux Commands and Utilities:** Entering the machine, The file System.

**Linux Utilities and Editor:** Same useful commands, Permission Modes and standard files, pipes, Filters and Redirection Shell Scripts, GUI, Editor.

**User to user Communication:** On-line Communication, off-line communication, Apache Server Settings, Network Server settings

**Unix System Administration:** System Administration, Installing Linux, Booting the system, Maintaining user Accounts, file systems and special files, Backups and Restoration.

**Windows 2000:** Windows 2000 Networking – Windows 2000 operating System Architecture, using the mapped Drive.

**Managing Windows 2000 Server:** Using Window 2000 Server and client, Logging onto the Network, Browsing Network Resources, Accessing Network Resources Using My Network places, Mapping a folder.

**Advanced Windows 2000 Networking:** Windows 2000 Domains, workgroups & Trusted Relationships, user Administration, Remote Access.

**Windows XP Networking:** Introduction to Windows XP Networking, Windows XP in file Systems, Sharing Network Resources in Windows XP, Enabling offline file features.

### Security and Management

**Security Concepts:** Goals of Computer Security, Security Problem and Requirements, Threats and Vulnerabilities, user Authentication, Security system and facilities, Cryptography, Intrusion

detection, Computer-security classifications.

**Computer Security: Hardening operating System and Application Code** – :Hardening file system security, Hardening Local Security policies, Hardening services, Hardening default Accounts, Hardening Network Activity, Fault Tolerant system, Backup and UPS.

**Security and Management-I:**Main issues is windows security Management, Domain controller, windows Resources security Management, Registry Management, Printer Management, Managing windows 2000 operating system, Active Directory, Windows 2000 DNS Management, Managing group policy.

**Security and Management-II:** User Authentication Management, users and group Management, resource Management, windows, 2000 Network-Security and Management, Encrypting file system Management.