

**Session 2024-25**

**Department of Computer Science  
Maharaja Ganga Singh University, Bikaner**

Post Graduate Diploma in Computer Application (Semester System)  
Choice Based Credit System

**Table of Contents**

| S.No. | Item  | Page No |
|-------|---|---------|
| 1     | Background                                  | 3       |
| 2     | Programme Outcomes (POs)                    | 5       |
| 3     | Programme Specific Outcomes (PSOs)          | 6       |
| 4     | Post Graduate Attributes                    | 7       |
| 5     | Structure of Masters' Courses               | 8       |
| 6     | Learning Outcome Index                      | 10      |
| 7     | Semester-wise Courses & Credit Distribution | 11      |
| 8     | Course Level Learning Outcomes              | 11      |
| 9     | Teaching-Learning Process                   | 29      |
| 10    | Assessment & Evaluation                     | 29      |

## Background

Considering the curricular reforms as instrumental for desired learning outcomes, all the academic departments of Maharaja Ganga Singh University Bikaner, made a rigorous attempt to revise the curriculum of postgraduate programs in alignment with National Education Policy-2020 and UGC Quality Mandate for Higher Education Institutions-2021. The process of revising the curriculum could be prompted with the adoption of the “Comprehensive Roadmap for Implementation of NEP-2020”. The Roadmap identified the key features of the Policy and elucidated the Action Plan with well-defined responsibilities and an indicative timeline for major academic reforms.

The process of revamping the curriculum started with a series of webinars and discussions conducted by the University to orient the teachers about the key features of the Policy, enabling them to revise the curriculum in sync with the Policy. Proper orientation of the faculty about the vision and provisions of NEP-2020 made it easier for them to appreciate and incorporate the vital aspects of the Policy in the revised curriculum focused on creating holistic thoughtful, creative, and well-rounded individuals equipped with the key 21st-century skills ‘for the development of an enlightened, socially conscious, knowledgeable, and skilled nation’.

With NEP-2020 in the background, the revised curricula articulate the spirit of the Policy by emphasising upon - an integrated approach to learning; innovative pedagogies and assessment strategies; multidisciplinary and cross-disciplinary education; creative and critical thinking; ethical and Constitutional values through value-based courses; 21st century capabilities across the range of disciplines through life skills, entrepreneurial and professional skills; community and constructive public engagement; social, moral, and environmental awareness; Organic Living and Global Citizenship Education (GCED); holistic, inquiry-based, discovery-based, discussion-based and analysis-based learning; exposure to Indian knowledge system, cultural traditions and literature through relevant courses offering “Knowledge of India, fine blend of modern pedagogies with indigenous and traditional ways of learning; flexibility in course choices, student-centric participatory learning; imaginative and flexible curricular structures to enable creative combinations of disciplines for study; offering multiple entry and exit points, alignment of Vocational courses with the International Standard Classification of Occupations maintained by the International Labor Organization; breaking the silos of disciplines; integration of extra-curricular and curricular aspects, exploring internships with local industry, businesses and artists and craft persons; closer collaboration between industry and higher education institutions for technical, vocational, and science programs, and formative assessment tools to be aligned with the learning outcomes, capabilities, and dispositions as specified for each course. The university has also developed a consensus on Blended Learning with 10% component of online teaching and 60% face-to-face classes for each program.

The revised curricula of various programs could be devised with concerted efforts of the faculty, Heads of the Departments, and the Deans of Schools of Study. The draft prepared by each department was discussed in a series of discussion sessions conducted at the Department, School, and University level. The leadership of the University has been a driving force behind the entire exercise of developing the uniform template and structure for the revised curriculum. The Vice-Chancellor of the University conducted series of meetings with Heads and Deans to deliberate upon the vital parameters of the revised curriculum to formulate a uniform template featuring Background, Programme Outcomes, Programme

# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

Specific Outcomes, Postgraduate Attributes, Structure of Masters Course, Learning Outcome Index, Semester-wise Courses and Credit Distribution, Course-level Learning Outcomes, Teaching-Learning Process, Blended Learning, Assessment and Evaluation, Keywords, References, and Appendices. The experts of various Board of Studies and School Boards contributed to a large extent in giving the final shape to the revised curriculum of each program.

To ensure the implementation of curricular reforms envisioned in NEP-2020, the University has decided to implement various provisions in a phased manner. Therefore, the curriculum may be reviewed annually so as to gradually include all relevant provisions of NEP-2020.

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## Choice Based Credit System

### Program Outcomes

On completing Post Graduate Diploma in Computer Applications, the students shall be able to realize the following outcomes:

| PO   | Description   |
|------|---|
| PO1  | Acquired knowledge with facts and figures related to various subjects in pure sciences such as Physics, Chemistry, Botany, Zoology, Mathematics, etc.   |
| PO2  | Understood the basic concepts, fundamental principles, and scientific theories related to various scientific phenomena and their relevance in day-to-day life.  |
| PO3  | Acquired the skills in handling scientific instruments, planning, and performing laboratory experiments. The skills of observations and drawing logical inferences from the scientific experiments.                               |
| PO4  | Analyzed the given scientific data critically and systematically and the ability to draw objective conclusions.   |
| PO5  | Been able to think creatively (divergent and convergent) to propose novel ideas in explaining facts and figures or providing new solutions to problems.   |
| PO6  | Realized how developments in any science subject help develop other science subjects and vice-versa and how interdisciplinary approach helps provide better solutions and new ideas for sustainable outcomes.                     |
| PO7  | Developed a scientific outlook concerning science subjects and all aspects related to life.   |
| PO8  | Realized that knowledge of subjects in other faculties such as humanities, performing arts, social sciences, etc., can have greatly and effectively influence, which inspires in evolving new scientific theories and inventions. |
| PO9  | Imbined ethical, moral, and social values in personal and social life, leading to a highly cultured and civilized personality.  |
| PO10 | Developed various communication skills such as reading, listening, speaking, etc., which will help express ideas and views clearly and effectively.   |
| PO11 | Realized that pursuit of knowledge is a lifelong activity and in combination with untiring efforts and positive attitude and other necessary qualities leads towards a successful life.   |

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## Choice Based Credit System

### Program Specific Outcomes (PSO)

On completing Masters in the Post Graduate Diploma in Computer Applications, the students shall be able to realize the following outcomes:

| PSO   | Description  |
|-------|--|
| PSO1  | Communicate computer science concepts, designs, and solutions effectively and professionally   |
| PSO2  | Apply knowledge of computing to produce effective designs and solutions for specific problems  |
| PSO3  | Use software development tools, software systems, and modern computing platforms   |
| PSO4  | To have the knowledge and the ability to develop creative solutions  |
| PSO5  | To develop skills to learn new technology  |
| PSO6  | To develop critical reasoning  |
| PSO7  | To apply computer science theory and software development concepts to construct computing-based solutions  |
| PSO8  | To design and develop computer programs/computer-based systems in the area related to algorithms, networking, web design, cloud computing, Artificial Intelligence, Mobile applications  |
| PSO9  | The ability to understand, analyse and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity  |
| PSO10 | The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success, real-world problems, and meet the challenges of the future |
| PSO11 | The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, lifelong learning and a zest for higher studies and also to act as a good citizen by inculcating in them moral values & ethics                           |

### Postgraduate Attributes

- Disciplinary Knowledge
- Creative & Critical Thinking
- Reasoning and Analytical abilities
- Logic/Discrete Mathematics knowledge
- Logical Thinking
- Problem analysis and solving abilities
- Life Skills
- Moral & Ethical Values
- Research Skills

Post Graduate Diploma in Computer Application (Semester System)  
Choice Based Credit System

**Structure of Masters' Programme**

**Scheme for  
Post Graduate Diploma in Computer Application (Semester I)  
Session 2024-25**

| <b>Semester I</b>   |                      |                                  |            |            |            |            |                                       |   |    |         |
|---------------------|----------------------|----------------------------------|------------|------------|------------|------------|---------------------------------------|---|----|---------|
|                     | Course Code          | Course Title                     | Exam Hours | Max. Marks |            | Min. Marks | L                                     | T | P* | Credits |
|                     |                      |                                  |            | Int. Marks | Ext. Marks |            |                                       |   |    |         |
| <b>Core Courses</b> |                      |                                  |            |            |            |            |                                       |   |    |         |
| 1                   | FS-COMP-PGDCA-CC-101 | Mathematics for Computer Science | 3          | 10         | 40         | 18 (36%)   | 3                                     | 1 | 1  | 5       |
| 2                   | FS-COMP-PGDCA-CC-102 | Internet Programming             | 3          | 10         | 40         | 18 (36%)   | 3                                     | 1 | 1  | 5       |
| 3                   | FS-COMP-PGDCA-CC-103 | Computer Organization            | 3          | 10         | 40         | 18 (36%)   | 3                                     | 1 | 1  | 5       |
| 4                   | FS-COMP-PGDCA-CC-104 | C++ Programming                  | 3          | 10         | 40         | 18 (36%)   | 3                                     | 1 | 1  | 5       |
| 5                   | FS-COMP-PGDCA-CC-105 | Combined Practical               | 3          | 25         | 75         | 36 (25%)   | *combined practical of above subjects |   |    |         |



**Post Graduate Diploma in Computer Application (Semester System)**  
Choice Based Credit System

**Scheme for**  
**Post Graduate Diploma in Computer Application (Semester II)**

**Session 2024-25**

| <b>Semester II</b>  |                      |                                   |            |            |            |            |                                       |   |    |         |
|---------------------|----------------------|-----------------------------------|------------|------------|------------|------------|---------------------------------------|---|----|---------|
|                     | Course Code          | Course Title                      | Exam Hours | Max. Marks |            | Min. Marks | L                                     | T | P* | Credits |
|                     |                      |                                   |            | Int. Marks | Ext. Marks |            |                                       |   |    |         |
| <b>Core Courses</b> |                      |                                   |            |            |            |            |                                       |   |    |         |
| 1                   | FS-COMP-PGDCA-CC-201 | Database Management System        | 3          | 10         | 40         | 18 (36%)   | 3                                     | 1 | 1  | 5       |
| 2                   | FS-COMP-PGDCA-CC-202 | Data Communication and Networking | 3          | 10         | 40         | 18 (36%)   | 3                                     | 1 | 1  | 5       |
| 3                   | FS-COMP-PGDCA-CC-203 | Operating System                  | 3          | 10         | 40         | 18 (36%)   | 3                                     | 1 | 1  | 5       |
| 4                   | FS-COMP-PGDCA-CC-204 | PHP                               | 3          | 10         | 40         | 18 (36%)   | 3                                     | 1 | 1  | 5       |
| 5                   | FS-COMP-PGDCA-CC-205 | Combined Practical & Project      | 3          | 25         | 75         | 36 (25%)   | *combined practical of above subjects |   |    |         |

# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

### Learning Outcome Index

Learning Outcomes are statements of knowledge, skills, and abilities a student should possess and demonstrate upon completion of learning experiences.

#### I. Programme Outcomes(PO) and Programme Specific Outcomes (PSO)

|      | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | PSO11 |
|------|------|------|------|------|------|------|------|------|------|-------|-------|
| PO1  | X    | X    | X    | X    | X    | X    | X    | X    |      | X     | X     |
| PO2  | X    |      | X    |      | X    | X    | X    | X    | X    | X     | X     |
| PO3  | X    | X    | X    |      | X    | X    | X    | X    | X    | X     | X     |
| PO4  | X    | X    | X    | X    | X    | X    |      | X    | X    | X     | X     |
| PO5  | X    | X    | X    | X    | X    | X    | X    | X    | X    | X     | X     |
| PO6  | X    | X    | X    | X    | X    | X    | X    |      |      | X     | X     |
| PO7  |      |      |      | X    | X    |      | X    |      | X    | X     | X     |
| PO8  |      | X    |      | X    |      | X    | X    | X    |      |       | X     |
| PO9  | X    | X    |      | X    | X    |      | X    | X    |      |       | X     |
| PO10 | X    | X    | X    |      | X    |      |      |      | X    |       | X     |
| PO11 | X    | X    | X    |      | X    | X    | X    | X    | X    | X     | X     |

#### II. Programme Specific Outcomes (PSO) and Core Courses (CC)

|       | PGDC<br>A<br>101 | PGDCA<br>102 | PGDCA<br>103 | PGDCA<br>104 | PGDCA<br>201 | PGDCA<br>202 | PGDCA<br>203 | PGDCA<br>204 |
|-------|------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| PSO1  | X                | X            | X            | X            | X            | X            | X            | X            |
| PSO2  | X                | X            | X            | X            | X            | X            | X            | X            |
| PSO3  |                  | X            |              | X            | X            |              |              | X            |
| PSO4  | X                | X            | X            | X            | X            | X            | X            | X            |
| PSO5  | X                | X            | X            | X            | X            | X            | X            | X            |
| PSO6  | X                |              | X            |              | X            | X            | X            |              |
| PSO7  | X                | X            | X            | X            | X            | X            | X            | X            |
| PSO8  |                  | X            |              | X            | X            |              |              | X            |
| PSO9  |                  | X            | X            | X            | X            |              |              | X            |
| PSO10 | X                | X            | X            | X            | X            | X            | X            | X            |
| PSO11 | X                | X            | X            | X            | X            | X            | X            | X            |

## Objectives, Course-level Learning Outcomes, Contents, and Suggested Readings

### Semester I

**Paper Code: FS-COMP-PGDCA-CC-101**

**Paper Name: Mathematics for Computer Science**

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**Course Objectives:**

- CO1. To learn to evaluate mathematical arguments revolving around computation
- CO2. To understand the basics of Combinations and Permutations
- CO3. To acquire the ability to represent relations matrices and digraphs
- CO4. To acquire and apply the knowledge on Graphs and Trees to real-world applications
- CO5. To have the ability to Demonstrate the working of Grammars and Languages

**Learning Outcomes:**

After completion of this course, the student will be able to-

- LO1. Comprehend and evaluate mathematical arguments revolving around computation.
  - LO2. Understand the basics of Combinations and Permutations.
  - LO3. Represent relations matrices and digraphs.
  - LO4. Apply the knowledge of Graphs and Trees to real-world applications.
  - LO5. Demonstrate the working of Grammar and Languages.
- 

**Note:** Non-scientific calculators may be allowed in the end-semester examination.

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**Course Description**

**Unit – I**

**Sets:** different types of sets, set operations; Basic Counting Principles, Pigeonhole Principle, Binomial Coefficients, Binomial Theorem, Permutations, Combinations; **Matrices:** addition, multiplication; **Vectors:** the position vector, addition, subtraction and products of vectors.

**Unit - II**

Mathematical Induction; **Logic:** Propositions and logical operations, Conditional statements, Tautologies and Contradictions, Logical Equivalence, quantifiers, Propositional logic and Predicate logic. Basic computability theory: Chomsky Hierarchy, the concept of models of computation, the concept of types of languages and grammars.

**Unit - III**

**Relations:** Representation of Relations, Properties of relations, transitive closure; **Ordered Sets:** poset, Properties, Hasse Diagram, Extremal elements of posets; **Functions:** Types of Functions, Asymptotic notations; **Coordinate Systems:** representation of points, straight lines, standard equation of circles.

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# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

### **Recommended Readings**

1. K.H. Rosen, Discrete Mathematics and its applications, seventh edition
2. Kolman, Busby and Ross, Discrete Mathematical Structures, Sixth Edition, PHI.

### **Suggested Readings**

3. Schaum's Outline Of Theory and Problems of Discrete Mathematics, Third Edition.
4. C L Liu, Elements of Discrete Mathematics, TMH,
5. John Vince, Foundation Mathematics for Computer Science: A Visual Approach, Springer
6. George B. Thomas and Ross L. Finney, Calculus and Analytic Geometry, Addison Wesley
7. J. Ullman and J. Hopcroft, Introduction to Automata Theory, Languages, and Computation, Pearson Education
8. Daniel I.A. Cohen, Introduction to Computer Theory, 2ed, Wiley.
9. Peter Linz, An Introduction to Formal Languages and Automata, Sixth edition.

# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

**Paper Code: FS-COMP-PGDCA-CC-102**

**Paper Name: Internet Programming**

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### **Course Objectives -**

CO1. To gain knowledge of how the client-server model of Internet programming works

CO2. To learn the design and development of interactive, client-side, executable web applications

CO3. To acquire the ability to demonstrate how Internet programming tasks are accomplished

CO3: To know how to build tools that assist in automating data transfer over the Internet.

CO4: To understand the advantages and disadvantages of the core Internet protocols

### **Learning Outcomes:**

After completion of this course, the student will be able to -

LO1: Explain how the client-server model of Internet programming works

LO2: Design and develop interactive, client-side, executable web applications

LO3: Demonstrate how Internet programming tasks are accomplished

LO3: Build tools that assist in automating data transfer over the Internet

LO4: Compare the advantages and disadvantages of the core Internet protocols

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### **Course Description**

#### **Unit I**

Internet Basics: Evolution of the Internet, Basic Internet terms and applications. ISP, Anatomy of an e-mail message, basics of sending and receiving, E-mail Protocol; Mailing List- Subscribing, Unsubscribing. Introduction to World Wide Web and its work, Web Browsers, Search Engine, Downloading, HyperText Transfer Protocol (HTTP), URL, Web Servers, FTP, Web publishing- Domain Name Registration, Space on Host Server for Web Site, Maintenance and Updating.

#### **Unit - II**

HTML: Elements of HTML & Syntax, Comments, Headings, Paragraph, Span, Pre Tags, Backgrounds, Formatting tags, Images, Hyperlinks, div tag, List Type and its Tags, Table Layout, Use of Forms in Web Pages. CSS: Introduction to Cascading Style Sheets, Types of Style Sheets (Inline, Internal and External), using Id and classes, CSS properties: Background Properties, Box Model Properties, Margin, Padding, List Properties, Border Properties, Positioning Properties.

#### **Unit - III**

Java Script: Introduction to Client-Side Scripting, Introduction to JavaScript, Comments, Variables in JS, Global Variables, Data types, Operators in JS, Conditions Statements (If, If Else, Switch), JavaScript Loops (For Loop, While Loop, Do While Loop), JS Popup Boxes (Alert, Prompt, Confirm), JS Events, Onload, Onunload, Onsubmit, OnFocus, Onchange Event, Onblur Event, Onmouseover, Onclick, Ondblclick Events, JS Arrays, Working with Arrays, JS Objects, Window object, Document object, JS Functions, getElementById, innerHTML property, inner Text property, form validation, email validation.

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# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

### **Recommended Readings**

1. Thomas A. Powell, HTML: The Complete Reference, Osborne/McGraw-Hill
2. Deitel, Deitel and Nieto, Internet & WWW. How to program, 2<sup>nd</sup> Edition, Pearson Education Asia.

### **Suggested Readings**

3. E Stephen Mack, Janan Platt, HTML 4.0, No Experience Required, 1998, BPB Publications.
4. Sybex, HTML Complete, BPB Publications.
5. V.K Jain, Internet and Web Page Designing, BPB Publications.
6. Ivan Bayross, Web Enabled Commercial Application Development Using HTML, DHTML, java script, Perl CGI, BPB publications.

# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

**Paper Code: FS-COMP-PGDCA-CC-103**

**Paper Name: Computer Organization**

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**Course Objectives:**

CO1: To understand the structure, function, and characteristics of computer systems.

CO2: To understand the design of the various functional units and components of computers.

CO3: To Identify the elements of modern instruction sets and their impact on processor design.

CO4: To acquire the ability to explain the function of each element of a memory hierarchy,

CO5: To identify and compare different methods for computer I/O

**Learning Outcomes:**

After completion of this course, the student will be able to-

LO1: Understand the structure, function, and characteristics of computer systems.

LO2: Understand the design of the various functional units and components of computers.

LO3: Identify the elements of modern instruction sets and their impact on processor design.

LO4: Explain the function of each element of a memory hierarchy,

LO5: Identify and compare different methods for computer I/O.

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### Unit I

**Components of a Computer:** Processor, Memory, Input-Output Unit, Difference between Organization and Architecture, Hardware-Software Interaction. **Number System:** Concept of Bit and Byte, types, and conversion. **Complements:** 1's complement, 2's complement. **Binary Arithmetic:** Addition, overflow, subtraction, multiplication (booth's algorithm), and division algorithm. **Logic gates:** Boolean Algebra, Map Simplification.

### Unit II

**Combinational circuits:** Half Adder, Full Adder, Decoders, Multiplexers. **Sequential circuits:** Flip Flops- SR, JK, D, T Flip-Flop, Excitation Tables, State Diagram, State Table, Registers, Counters.

**Input-Output Organization:** Peripheral devices, I/O Interface, Asynchronous Data Transfer, Modes of Data Transfer, Priority Interrupt, Direct Memory Access, I/O Processor.

**Memory Organization:** Types and capacity of Memory, Memory Hierarchy, Associative Memory, Buffer, Cache Memory, Virtual Memory.

### Unit III

**Intel 8085 Microprocessor:** Introduction, ALU, Timing and Control Unit, Register Set, Data and Address Bus, Addressing modes, Complete Intel 8085 Instruction set, Instruction format, Opcode and Operand, Word Size, Instruction Cycle, Pin Configuration, Intel 8085 programs.

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# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

### **Recommended Readings**

1. M. Morris Mano, Computer System Architecture, Pearson, Prentice Hall.
2. J.P. Hayes, Computer Architecture & Organization, Tata McGraw Hill

### **Suggested Readings**

3. Malvino Leach and Jerald A. Brown, Digital Computer Electronics, McGraw Hill.
4. Ramesh Gaonkar, Microprocessor Architecture, Programming, and Application With the 8085, PENRAM.
5. B.Ram, Fundamentals of Microprocessor and Microcomputers, Danpat Rai Publications.



# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

**Paper Code: FS-COMP-PGDCA-CC-104**

**Paper Name: C++ Programming**

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### **Course Objectives:**

CO1. To declare, initialize and process variables, constants, and arrays

CO2. To read and print values from the keyboard

CO3. To create statements for decisions and loops

CO4. To define functions and return values

CO5. To create classes, objects, and constructors

CO6. To understand and apply OO design concepts

### **Learning Outcomes:**

After completion of this course, the student will be able to-

LO1. Declare, initialize and process variables, constants, and arrays

LO2. Read and print values from the keyboard

LO3. Create statements for decisions and loops

LO4. Define functions and return values.

LO5. Create classes, objects, and constructors.

LO6. Understand and apply OO design concepts.

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## **Unit I**

**Object-Oriented System** Object-Oriented Paradigm: need, characteristics, applications. Basics of C++, branching, looping, and jump statements. **Functions:** need, types, passing arguments by value and reference, recursive function, pointers, and functions. **Arrays:** need, types, array and function, array and pointers.

## **Unit II**

**Class:** Basics, static data members, Inline Function, Constructors and Destructors: need, types, usage, **Inheritance** - need, usage, types, compile-time and run-time polymorphism, overloading and overriding, virtual function, friend function, abstract class. **Operator overloading:** need, rules, through member function and through friend function.

## **Unit III**

String handling, String class, Templates, Additional Features for C++ 11, C++14 and C++17 Searching and Sorting: **Searching:** Linear Search, Binary Search. **Sorting:** Insertion Sort, Selection Sort, Quick Sort, Bubble Sort, Heap Sort, Shell Sort, Merge sort, Radix Sort, Counting Sort, Bucket Sort.

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## **Recommended Readings**

1. E. Balagurusamy, Object-Oriented Programming With C++ , Tata Mcgraw Hill.
2. Herbert Schildt, C++ The Complete Reference, Tata Mcgraw Hill.

# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

### Suggested Readings

3. Schaum Series, Object Oriented Programming With C++, Tata Mcgraw Hill.
4. Paul J. Deitel and Harvey M. Deitel, C++11 for Programmers (Deitel Developer), Prentice Hall; 2nd edition.
5. Marc Gregoire, Nicholas A. Solter and Scott J.Kleper, Professional C++, Goodreads Publications.
6. Bjarne Stroustrup, A Tour of C++.
7. Bartłomiej Filipek, C++17 in Detail.

## Semester II

**Paper Code: FS-COMP-PGDCA-CC-201**

**Paper Name: Database Management System**

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**Course Objectives:**

- CO1: To understand the need for a DB approach and understand the components and roles of DBMS
- CO2: To know how to write SQL queries for the given problem statement
- CO3: To apply DB system development life cycle to business problems
- CO4: To develop ER diagram for representing the conceptual data model
- CO5: To convert ER diagram into a set of relations representing the logical data model
- CO6: To implement a collection of ties in the chosen DBMS product, such as ORACLE
- CO7: To have a broad understanding of database concepts and database management system software
- CO8: To have a high-level experience of major DBMS components and their function
- CO9: To be able to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model.
- CO10: To be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
- CO11: To understand detailed architecture, define objects, load data, query data, and performance tune SQL databases.
- CO12: To be able to handle large volumes of structured, semi-structured, and unstructured data using database technologies.

**Learning Outcomes:**

After completion of this course, the student will be able to-

- LO1: Appreciate the need for a DB approach and understand the components and roles of DBMS
- LO2: Write SQL queries for the given problem statement
- LO3: Apply DB system development life cycle to business problems
- LO4: Develop ER diagram for representing the conceptual data model
- LO5: Convert ER diagram into a set of relations representing the logical data model
- LO6: Implement a collection of ties in the chosen DBMS product, such as ORACLE
- LO7: Have a broad understanding of database concepts and database management system software
- LO8: have a high-level experience of major DBMS components and their function
- LO9: be able to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model.
- LO10: be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
- LO11: To understand detailed architecture, define objects, load data, query data, and performance tune SQL databases.
- LO12: Able to handle large volumes of structured, semi-structured, and unstructured data using database technologies.

# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

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### Unit I

**Introduction:** Characteristics of database approach, Advantages, Database system architecture, Overview of different types of Data Models and data independence, Schemas and instances, Database languages and interfaces; **E-R Model:** Entities, Attributes, keys, Relationships, Roles, Dependencies, E-R Diagram; Normalization: Definition, Functional dependencies and inference rules, 1NF, 2NF, 3NF, and BCNF.

### Unit II

**Introduction to Relational model,** Constraints: Domain, Key, Entity integrity, Referential integrity; Keys: Primary, Super, Candidate, Foreign; **Relational algebra:** select, project, union, intersection, minus, cross product, different types of join, division operations; aggregate functions and grouping; **SQL:** Data Types, statements: select, insert, update, delete, create, alter, drop; views, SQL algebraic operations, nested queries; Stored procedures: Advantages, Variables, creating and calling procedures, if and case statements, loops, Cursors, Functions, Triggers.

### Unit III

**Transactions processing:** Definition, desirable properties of transactions, serial and non-serial schedules, the concept of serializability, conflict-serializable schedules; **Concurrency Control:** Two-phase locking techniques, dealing with Deadlock and starvation, deadlock prevention protocols, basic timestamp ordering algorithm; Overview of database recovery techniques; the concept of data warehousing.

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### Recommended Readings

1. Ramez A. Elmasri, Shamkant Navathe, Fundamentals of Database Systems, 5<sup>th</sup> Ed, Pearson Publications.
2. Korth, Silberschatz, Sudarshan, Database System Concepts, Mcgraw Hill.

### Suggested Readings

3. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publication.
4. Ivan Bayross, SQL, PL/SQL Programming, BPB publications.
5. Ivan Bayross, Commercial Application Development Using Oracle Developer 2000, BPB publications.

### Web Resources

1. <http://www.mysqltutorial.org/mysql-stored-procedure-tutorial.aspx>

# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

**Paper Code: FS-COMP-PGDCA-CC-202**

**Paper Name: Data Communication and Networking**

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### **Course Objectives:**

After completion of this course the student will be able to-

- CO1. To gain the ability to create a new protocol and test its efficiency
- CO2. To design a new network architecture using protocols and interfaces
- CO3. To create a hybrid topology using the existing topologies, and check inefficiency
- CO4. To apply different encoding and decoding mechanisms involved in various types of transmission media and measure the transmission impairments
- CO5. To design a model internet with various categories of networks and test the transmission rate
- CO6. To understand the basics of data communication, networking, the internet, and their importance
- CO7. To analyze the services and features of various protocol layers in data networks
- CO8. To differentiate wired and wireless computer networks
- CO9. To analyze TCP/IP and their protocols
- CO10. To recognize the different internet devices and their functions
- CO11. To identify the primary security threats of a network

### **Learning Outcomes:**

After completion of this course the student will be able to-

- LO1. Create a new protocol and test its efficiency.
  - LO2. Design a new network architecture using protocols and interfaces.
  - LO3. Create a hybrid topology using the existing topologies, and check inefficiency.
  - LO4. Apply different encoding and decoding mechanisms involved in various types of transmission media and measure the transmission impairments.
  - LO5. Design a model internet with various categories of networks and test the transmission rate.
  - LO6. Understand the basics of data communication, networking, the internet, and their importance.
  - LO7. Analyze the services and features of various protocol layers in data networks.
  - LO8. Differentiate wired and wireless computer networks.
  - LO9. Analyze TCP/IP and their protocols.
  - LO10. Recognize the different internet devices and their functions.
  - LO11. Identify the primary security threats of a network.
- 

### **Unit - I**

**Data Communication and Networking:** Overview, Network Types, LAN Technologies, Topologies, Models- OSI Model, TCP/IP Stack, Security

**Physical Layer:** Introduction, Impairments, Performance, Digital Transmission, modes, digital to digital, analog to digital, Analog Transmission, digital to analog, analog to analog, Transmission media, Wireless Transmission, Multiplexing, FDM, TDM, CDM, WDM,

**Switching techniques:** Circuit Switching, Packet switching, Datagram, Virtual circuit, and Permanent Virtual Circuit, Connectionless and connection-oriented communication, Message switching,

# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

### Unit - II

**Data Link Layer:** Introduction, Error Detection, and Correction, Data Link Control: Line Discipline- Enq/Ack, Poll/Select, **Flow Control:** Stop And Wait, Sliding Window, **Error Control:** ARQ, Stop and Wait ARQ, Sliding Window ARQ.

**Network Layer:** Introduction, Network Addressing, Routing, Internetworking, Tunneling, Packet Fragmentation, Network Layer Protocols, ARP, ICMP, IPv4, IPv6

**Transport Layer:** Introduction, Function, End to end communication, Transmission Control Protocol, User Datagram Protocol

**Application Layer:** Introduction, Client-Server Model, Application Protocols, Network Services

### Unit - III

**Cyber Security:** definition, cybercrime and information security, cybercriminals, classification of cybercrime. Cyber offenses: categories of cybercrime.

**Tools and methods used in cybercrime:** phishing, types of phishing, types, and techniques of ID theft, password cracking, keyloggers and spyware, backdoors, steganography, DoS, SQL Injection.

**Cybercrime on mobile and wireless devices:** attacks on wireless networks, Authentication security service, attacks on mobile phones. Cyber Law, The Indian IT Act, Digital Signatures, Anti-Cybercrime Strategies, Cyberterrorism, Indian ITA 2000.

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### Recommended Readings

1. Nina Godbole & Sunit Belapur, Cyber Security.
2. Forozan, Data Communication and Networking, Tata McGraw Hill.

### Suggested Readings

3. Dr. Madhulika Jain, Satish Jain, Data Communication And Computer Networks, BPB publications.
4. William Stallings, Data and Computer Communications, Pearson Education.
5. A. S. Tanenbaum, Computer Networks, Fourth Edition, Pearson Education.

# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

**Paper Code: FS-COMP-PGDCA-CC-203**

**Paper Name: Operating System**

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### **Course Objectives:**

- CO1. To be able to design and understand the following OS components: System calls, Schedulers, Memory management systems, Virtual Memory, and Paging systems.
- CO2. To be able to evaluate, and compare OS components through instrumentation for performance analysis.
- CO3. To analyze the various device and resource management techniques for time-sharing and distributed systems
- CO4. To develop and analyze simple concurrent programs using transactional memory and message passing, and understand the trade-offs and implementation decisions

### **Learning Outcome:**

After completion of this course, the student will be able to-

- LO1. Allocate Main Memory based on various memory management techniques
  - LO2. Compare Memory allocation using Best fit, Worst fit, and first hold policies
  - LO3. Apply page replacement policies for dynamic memory management
  - LO4. Schedule CPU time using scheduling algorithm for processors
  - LO5. Compare various device scheduling algorithms. serve
- 

### **Unit I**

Introduction to Operating System, layered Structure, Functions, Types; Process: Concept, Process States, PCB; Threads, System calls; Process Scheduling: types of schedulers, context switch, CPU Scheduling, Preemptive Scheduling, Scheduling Criteria- CPU Utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling Algorithms- FCFS, SJF, Priority Scheduling, Round Robin Scheduling, MLQ Scheduling.

### **Unit II**

Synchronization: Critical Section Problem, Requirements for a solution to the critical section problem; Semaphores, simple solution to Readers-Writers Problem. Deadlock: Characterization, Prevention, Avoidance, Banker's Algorithm, Recovery from Deadlock. Memory Management: Physical and virtual address space, Paging, Overview of Segmentation; Virtual Memory Management: Concept, Page Replacement techniques- FIFO, LRU, Optimal.

### **Unit III**

Linux: features of Linux, steps of Installation, Shell and kernel, Directory structure, Users and groups, file permissions, commands- ls, cat, cd, pwd, chmod, mkdir, rm, rmdir, mv, cp, man, apt, cal, uname, history etc.; Installing packages; Shell scripts: writing and executing a shell script, shell variables, read and expr, decision making (if-else, case), for and while loops.

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### **Recommended Readings**

1. Abraham Silberschatz, Peter Baer Galvin, Operating System Principles, John Wiley And Sons Inc.
2. Milan Milen Kovic, Operating System Concepts And Design, Tata Mcgraw Hill.

# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

### **Suggested Readings**

3. Andrew S. Tanenbaum, Herbert Bos, Modern Operating System.
4. Mike McGrath, Linux in easy steps.
5. Sumitabha Das, Unix concepts and applications, TMH.



# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

**Paper Code: FS-COMP-PGDCA-CC-204**

**Paper Name: PHP**

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### **Unit – I**

**PHP:** Installation of PHP. **Building Blocks of PHP:** Variables, data types, Operators & Expressions, Constants, Switching, Flow, Loops. **Functions:** Meaning, Calling, Defining a function. Return value from user defined function. **Arrays:** Creating arrays, Array related functions. **Working with String, Date & Time:** Formatting String with PHP, Using Date and time Functions with PHP. Working with file and Directories.

### **Unit - II**

**Forms:** Creating simple input Form. Accessing Form input with user defined arrays, HTML and PHP Code on a single page. Redirecting User. Working with File Upload. Uploading & Downloading.

**State management:** Using query string(URL rewriting), Using Hidden field, Using cookies, Using session.

### **Unit - III**

**Exception Handling:** Understanding Exception and error, Try, catch, throw

**Connecting to the MYSQL:** Selecting a database, Adding data to a table, Displaying returned data on Web pages, Inserting data, Deleting data, Entering and updating data, Executing multiple queries, executing stored procedures.

### **Suggested Readings:**

6. Teach Yourself PHP, MYSQL & Apache By Meloni, Pearson Education.
7. Open Source Development with LAMP: Using Linux, Apache, MySQL, Perl & PHP By James Lee, Pearson Education.
8. PHP: A Beginner's Guide By Vaswani, Vikram Tata Mc-Graw Hill.

# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

**Paper Code: FS-COMP-PGDCA-CC-205**

**Paper Name: Combined Practical & Project**

**Course Objectives:**

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- CO1. Identify and define the problem statement
- CO2. Define and justify the scope of the proposed problem
- CO3. Gather and analyze system requirements
- CO4. Propose an optimized solution among the existing solutions
- CO5. Practice software analysis and design techniques
- CO6. Develop technical report writing and oral presentation skills
- CO7. Develop a functional application based on the software design
- CO8. Apply to code, debugging, and testing tools to enhance the quality of the software
- CO9. Prepare the proper documentation of software projects following the standard guidelines
- CO10. Become a master in specialized technology
- CO11. Become updated with all the latest changes in the technological world.
- CO12. Ability to communicate efficiently.
- CO13. Ability to be a multi-skilled engineer with sound technical knowledge, management, leadership, and entrepreneurship skills.
- CO14. Capability and enthusiasm for self-improvement through continuous professional development and life-long learning
- CO15. Awareness of the social, cultural, global, and environmental responsibility of an engineer.

Learning Outcomes

After completing this course, students will be able to:

- LO1. Identify and define the problem statement
  - LO2. Define and justify the scope of the proposed problem
  - LO3. Gather and analyze system requirements
  - LO4. Propose an optimized solution among the existing solutions
  - LO5. Practice software analysis and design techniques
  - LO6. Develop technical report writing and oral presentation skills
  - LO7. Develop a functional application based on the software design
  - LO8. Apply to code, debugging, and testing tools to enhance the quality of the software
  - LO9. Prepare the proper documentation of software projects following the standard guidelines
  - LO10. Become a master in specialized technology
  - LO11. Become updated with all the latest changes in the technological world.
  - LO12. Ability to communicate efficiently.
  - LO13. Ability to be a multi-skilled engineer with sound technical knowledge, management, leadership, and entrepreneurship skills.
  - LO14. Capability and enthusiasm for self-improvement through continuous professional development and life-long learning
  - LO15. Awareness of the social, cultural, global, and environmental responsibility of an engineer.
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**Practical Training and Project Work:**

1. Project Work may be done individually or in groups in case of bigger projects. However, if the project is done in groups, each student must be given responsibility for a distinct module and care should be taken to monitor the individual student.

# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

2. Project Work can be carried out in the college or outside with prior permission of the college.
3. The Student must submit a synopsis of the project report to the college for approval. The Project Guide can accept the project or suggest modification for resubmission. Only on acceptance of the draft project report, the student should make the final copies.

### **Submission Copy:**

The Student should submit a spiral-bound copy of the project report.

### **Format of the Project:**

1. **Paper:**  
The Report shall be typed on White Paper of A4 size.
2. **Final Submission:**  
The Report to be submitted must be original.
3. **Typing:**  
**Font:-** Times New Roman  
**Heading:-** 16 pt., Bold  
**Subheading:-** 14 pt, Bold  
**Content:-** 12 pt.  
**Line Spacing:-** 1.5 lines.  
**Typing Side :-**One Side  
**Font Color:-** Black.
4. **Margins:**  
The typing must be done in the following margin:  
**Left :** 0.75”  
**Right:** 0.75”  
**Top:** 1”  
**Bottom:** 1”  
**Left Gutter:** 0.5”
5. **Binding:**  
The report shall be Spiral Bound.
6. **Title Cover:**  
The Title cover should contain the following details:  
**Top:** Project Title in block capitals of 16pt.  
**Centre:** Name of project developer's and Guide name.  
**Bottom:** Name of the university, Year of submission all in block capitals of 14pt letters on separate lines with proper spacing and centering.
7. **Blank sheets:**  
At the beginning and end of the report, two white blank papers should be provided, one for the Purpose of Binding and other to be left blank.
8. **Content:**
  - I). Acknowledgment
  - II). Institute/College/Organization certificate where the project is being developed.
  - III). Table of contents
  - IV). A brief overview of the project
  - V). Profiles of problems assigned
  - VI). Study of Existing System
  - VII). System Requirement
  - VIII). Project plan
    - a) Team Structure
    - a) Development Schedule

# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

- Programming language and Development Tools
    - IX).** Requirement Specification
    - X).** Design
  - Detailed DFD and Structure Diagram
  - Data structure, Database and File Specification
- XI).** Project Legacy
- Current Status of project
  - Remaining Areas of concern
  - Technical and Managerial Lessons Learnt
  - Future Recommendations
- Nomenclature and Abbreviations.
  - Bibliography
  - Source Code

## Teaching-Learning Process

The teaching learning process may include the following-

- Lectures
- Discussions
- Simulations
- Virtual Labs
- Role Playing
- Participative Learning
- Interactive Sessions
- Seminars
- Research-based Learning/ Dissertation/ Case Study/ Project Work

The Blended Learning mode of teaching and learning is preferable in which offline (face-to-face) and online learning both are used to provide learners the opportunity to enjoy both of the worlds. Teachers can share instructions, lecture notes, and assignments online. On the other hand, students can share information/work/assignments with teachers and other students directly in a collaborative setting. This may have a more enriched learning experience, and collaboration between students can be improved upon if group activities rely on information gathered from online resources or lessons. Students who complete online coursework followed by interactive, face-to-face class activities have richer educational experiences.

## Assessment and Evaluation

- A comprehensive and continuous evaluation by mid-semester examinations at regular intervals to find out each course level learning outcome
- Formative assessment on the basis of activities of a learner throughout the program instead of one assessment. for this provision of internal exams, student seminars, and assignments is included
- Open book exam is suggested for internal/ mid-term exams to better facilitate the understanding of the knowledge required
- Group examinations are recommended on problem-solving exercises and in major projects to enhance the teamwork capabilities of the learner
- Collaborative/Individual assignments are useful to enhance the capability of learners to gain domain-specific knowledge
- Student Seminars and Quizzes are recommended for the continuous learning and evaluation process

### ELIGIBILITY FOR ADMISSION

Graduates of any statutory university shall be eligible for admission to the PGDCA Course. (Eligibility Marks/ Relaxation as per Government/University Rules)

### PASS CRITERIA

For passing in the examination, a candidate is required to obtain at least a Satisfactory Grade in each paper (Internal + External) and also acquire a Satisfactory Grade in theory and practical separately (in each semester examination).

# Post Graduate Diploma in Computer Application (Semester System)

## Choice Based Credit System

### INSTRUCTIONS TO PAPER SETTER

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit). **Section-B** will consist of 9 questions (3 questions from each unit). **Section C** will consist of 6 questions (2 questions from each unit).

The word limit of parts A, B, and C are 50, 200, and 500 respectively

### INSTRUCTIONS FOR PRACTICAL EXAMINATION

Marks Distribution for Practical Exam -

Each practical exam is to be conducted by two examiners one External and one Internal. The external examiner should be a senior lecturer from the jurisdiction of other universities.

Credit Weightage distribution for external practical of 4 credits is as under

- |  |           |
|--|-----------|
| a) Practical Examination exercise of 3 questions | 2 credits |
| b) Viva-Voce                                     | 1 credit  |
| c) Laboratory Exercise File                      | 1 credit  |

Marks distribution for External Project report of 40 marks is as under

External Evaluation-

|                     |           |
|---------------------|-----------|
| Project/ Case Study | 2 credits |
| Presentation        | 1 credit  |
| External Viva Voce  | 1 credit  |

Internal Evaluation- Project 1 credit

### INSTRUCTIONS FOR STUDENTS

The student has to complete two months of career-oriented summer training from any firm/organization. If the student does not get a chance to go for training, he/she can choose a research topic and can complete the dissertation under the supervision of any of the faculty in his college.

The student who has to opt for training has to provide a signed certificate from the firm/organization authority stating that the student has spent two months as a trainee in his organization/firm. The student who has opted for a dissertation has to submit his/her dissertation report with a certificate from his supervisor.

In both cases, the student has to present his work in front of all the faculty members and fellow students at the starting of the next session.

In terms of credits, every one-hour session of L amounts to 1 credit per semester and a minimum of two-hour sessions of T or P amounts to 1 credit per semester.

**\* An Academic/ Industrial Tour shall be organized by the college/department in every session. A Tour Report shall be prepared and submitted by the students after a study tour to industries/academic institutions of repute.**

### EVALUATION

|                       |                        |     |
|-----------------------|------------------------|-----|
| Internal Assessment - | Midterm Examination    | 10% |
|                       | Term paper             | 10% |
|                       | Students Participation | 5%  |
| External Assessment-  | 75%                    |     |

### Examination Paper Pattern

The question paper contains 3 sections. **Section-A** consists of 10 questions (at least 3 questions from each unit of syllabus). **Section-B** will consist of 9 questions (3 questions from each unit). **Section-C** will consist of 6 questions (2 questions from each unit). The word limit of part A, B and C are 50, 200 and 500 respectively

## Key Features of Revised Curriculum

Following are the key features of the revised curriculum-

- Student Centric Teaching and Learning approach
- Technology oriented approach of teaching
- Hand-on Practical/ Laboratory Sessions
- Problem-oriented teaching and learning
- Problem-analysis oriented assignments and evaluation
- Enhance logical thinking and analytical capabilities