

# Gauhati University

## Post Graduate Diploma in Computer Application

Preferably students having Mathematics at the Higher Secondary level and obtaining minimum pass mark in the subject be admitted to the course OR a special bridge course may be designed by the Colleges for students not having Mathematics at the Higher Secondary level.

Number of hours/day - 4 hours

Number of days/week - 4 days

### Semester I

Sl No.	Subject Code	Name of the Subject	Hours		Marks(%)	
			Theory	Practical	Theory	Practical
1	PGDCAP1	ICT Hardware	25	36	50	50
2	PGDCAP2	Programming in C	30	32	70	30
3	PGDCAP3	Overview of Operating System (DOS, Windows, UNIX / Linux and Shell Programming)	16	38	30	70
4	PGDCAP4	Introduction to Office Automation	12	50	20	80
5	PGDCAP5	Database Management System	36	26	70	30

### Semester II

Sl. No.	Subject Code	Name of the Subject	Hours		Marks(%)	
			Theory	Practical	Theory	Practical
1	PGDCAP6	Data Structure through C language	36	20	70	30
2	PGDCAP7	Internet and Web Technology	25	30	50	50
3	PGDCAEL1	GUI Application Programming	25	30	50	50
	PGDCAEL2	Computer Oriented Numerical Methods	36	20	70	30
	PGDCAEL3	Computer Graphics	36	20	70	30
	PGDCAEL4	Object Oriented Programming with C++	36	20	70	30
4		Project	100 marks			

## **PGDCAP1 ICT Hardware**

**UNIT I** Fundamentals: Block Diagram of a Computer, CPU, Memory (Primary/Secondary), RAM, ROM, Hardware, Software, Representation of Information, Number Systems-binary, octal, hexadecimal, ASCII, EBDIC, Gray codes.

**UNIT II:** Evolution of computer system, Modern computer, Classification of computer, Personal Computer hardware: Monitor, Keyboard, Mouse, Scanner, printer, speaker

**UNIT III:** Hard Disk Drive: logical structure and file system, FAT, NTFS. Hard disk tools: Disk cleanup, error checking, de fragmentation, scanning for virus, formatting, installing additional HDD. New trends in HDD. Floppy Disk Drive

**UNIT IV:** Optical Media, CDROM, theory of operation, drive speed, buffer, cache, CD-r, CD-RW, DVD ROM, DVD technology, preventive maintenance for DVD and CD drives, New Technologies. Driver installation, Writing and cleaning Cd and DVD.

**UNIT V:** Processor: Intel processor family. Latest trends in processor, Motherboard, Sockets and slots, power connectors. Peripheral connectors. Bus slots, USB, pin connectors. Different kinds of motherboards. RAM, different kinds of RAM. RAM up gradation. Cache and Virtual Memory concept.

**UNIT VI:** SMPS. BIOS. Network Interface Card, network cabling, I/O Box, Switches, RJ 45 connectors, Patch panel, Patch cord, racks, IP address.

### **IT PRACTICAL WORK SHOP:**

#### **Objectives:**

The Practical introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like Windows OS, LINUX OS, device drivers. Basic system administration in Linux which includes: Basic Linux commands in bash, Create hard and symbolic links, Text processing, using wildcards In addition hardware and software level troubleshooting process, tips and tricks would be covered.

Different ways of hooking the PC on to the network and internet from home and workplace and effectively usage of the internet. Configuring the TCP/IP setting. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced.

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Basic commands in Linux

Task 6: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

Task 7: Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

Task 8: The test consists of various systems with Hardware / Software related troubles, Formatted disks without operating systems. Installation of anti virus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

#### **BOOKS RECOMMENDED :**

1. Vikas Gupta; Comdex' Hardware and Networking Course Kit; DreamTech press.
2. Ron Gilster; PC hardware: A beginners Guide; Tata McGraw Hill. (First edition).

## **PGDCAP2 Programming in C**

Basic concepts of Computing:

Introduction to Programming

Concept of computing: Algorithm, Flowchart

Programming Languages (Machine language, Assembly language, High Level Language)

Translators (Assembly, Compiler, Interpreter)

Algorithm for Problem Solving

Introduction to C Language Data types, Operators, Conditional Statements & Loops  
Function, parameter passing,

Arrays, Pointers(programs using array and pointers like sum, average, minimum, maximum of numbers of an array, add and delete an element of an array, merge two sorted arrays ,string manipulation, programs like addition and their combination, sum of rows, columns and diagonal elements of matrix, transpose of matrix)

Structures (Declaration and use, structure member resolution, structure pointer resolution) and union

File Processing (file in C-opening, closing, reading and writing of files)

### **BOOKS RECOMMENDED:**

1. R.G.Dromey; How to solve it by Computer; Prentice Hall of India, 1992; (First Edition).
2. Cooper, Mullish; The Spirit of C, Jaico Publishing House; New Delhi, 1987. (Fourth Edition).
3. B. Gottfried; Programming in C; Tata McGraw Hill, New Delhi; (Second Edition).
4. B.W. Kernighan, D. M. Ritchie; The C Programming Language; Prentice Hall of India, 1989. (Second Edition).

## **PGDCAP3 Overview of Operating System**

What is operating system? Types of operating system, ( Batch, multiprogramming, time sharing, real time system) Functions of OS, Operating system as resource manager.

**Disk operating system:** main files, DOS Commands-Internal Commands & External Commands. Batch files.Config.sys and Autoexec.bat file.

**Windows OS**-An overview of different versions of windows, Basic windows elements. File management through windows. Windows accessories, windows Explorer, Entertainment system tools, Understanding OLE.

**Linux OS** : Introduction to Linux, Files and directories, architecture(kernel, shells, utilities) and various Linux commands. File manipulations, redirection and filters , editors( vi, ed etc.) Concept of process, System administration: File system, system administration commands.

### **BOOKS RECOMMENDED :**

1. Rajiv Mathur; Learning Windows 98 Step-By-Step; BPB Publication.
2. Crawford; Window 98 - No Experience Required; BPB Publications.
3. Sumitabha Das; UNIX concepts & applications; Tata McGraw Hill, New Delhi; (fourth Edition).
4. A.S. Tanenbaum; Modern Operating Systems; Prentice Hall of India, New Delhi, 1995; (Third Edition).

## **PGDCAP4 Introduction to Office Automation**

### **Word Processing**

Introduction to Word Processing , Features , Learning document window, Creating , Saving & Closing a document, Opening an Existing document , Editing a Document , Formatting Features ( Paragraph Formats, Aligning text & paragraph, Border and Shading, Header & Footers, Bullet & Numbering ) , Inserting & Editing a Table , Inserting Picture, Checking & Spelling Correction, Page Setup , Print Preview , Printing a document , Mail Merge , Document Template & Wizards.

### **Spreadsheet**

Introduction to Spreadsheet, creating, saving and editing a workbook, Inserting, deleting Worksheets, Opening & Moving around in an existing worksheets, Working with Formula

& Cell referencing. Functions, Working with ranges - creating, editing and selecting ranges. Format Feature :: AutoFormat Feature, Changing alignment, Character styles, Date Format, Border & Colors etc. Previewing & Printing a worksheet, Creating Charts & Graphs. Database in worksheet, macro, linking and embedding

### **Presentation Tools**

Creating & saving Presentations , Opening an existing Presentation, Working in different views, Working with slides, Adding and Formatting Text, Formatting Paragraphs, Checking Spelling and correcting typing mistakes , Adding clip art and other pictures, Inserting Animation, Designing slide shows, Running and controlling slide show, Printing Presentation.

**Portable Document Format:** storing, creation, conversion.

### **DTP Software**

Local language pack in Office Packages: installation and use.

Document design using any DTP package. Graphics design and manipulation using any currently available package.

### **BOOKS RECOMMENDED :**

1. Rajiv Mathur; Learning Word 97 for Windows Step-By-Step; BPB Publication. Publication
2. Rajiv Mathur; Learning Excel 97 for Windows Step-by-Step; BPB publication.
3. Lonnie E. Moseley and David M. Boodey; Mastering Office 97, BPB Publications.
4. Microsoft Office 97 –Unleashed; Techmedia.
5. Perry; Teach Yourself Office 97 in 24 Hours – Techmedia.
6. Hart; ABC of Office 97 Professional; BPB Publications.

## **PGDCAP5 Database Management System**

Overview of Database Management

Definition of Database, characteristics of database approach Advantages of DBMS

E-R model as a tool for conceptual design- entities, attributes and relationships, weak entity and strong entity, Relational Models

Relational DBMS, RDBMS terminology, primary key and foreign key Relational database design Integrity constraints, functional dependencies, Normal forms (1NF, 2NF, 3NF, BCNF)

Introduction to SQL, Advantages of SQL, Data types & literals, Creating tables & Inserting, Deleting and Updating Records, Types of SQL commands, SQL Operators and their precedence. Queries and sub queries, Use of Built-in functions, Aggregate Queries, Join Operations in SQL. Application Programming Interfaces and integration of front end and back end.

### **BOOKS RECOMMENDED**

1. R. Elmasri, S, Navathe; Fundamentals of Database Systems, Benjamin Cummings, 1994; (Second Edition).
2. H. Korth, A.Silberschatz; Database System Concepts; McGraw-Hill, 1991; (Second Edition).
3. A K Majumdar, P Bhattacharyya; Database Management Systems; Tata McGraw-Hill, 1996. (First Edition).

## **PGDCAP6 Data Structure through C Language**

### **Introduction to data structure**

Basic concept, Abstract data types, Fundamental and derived data types. Representation, primitive data structures.

### **Arrays**

Single and multidimensional arrays. Address calculation using column and row major ordering. Various operations on Arrays. Matrix multiplication.

### **Stack and queues**

Representation of stacks and queue using arrays and linked-list. Circular queues.

### **Applications of stacks**

Conversion from infix to postfix and prefix expressions, postfix evaluation algorithm

### **Linked lists**

Singly linked list; operations on Linked-list . Circular linked lists, Doubly linked lists.

### **Trees**

Basic terminology, Binary tree traversal methods - Preorder, Inorder and Postorder . Application of binary tree, Binary search tree, insertion and search operations on binary search tree.

### **Searching and sorting**

Searching: Sequential and binary searches.

Sorting - Insertion, selection, bubble, quick, merge, radix.

### **Graphs**

Definition of Graph, Graph terminology, Directed, Undirected & Weighted graphs.

Graph representation: Adjacency matrix, Adjacency lists.

### **BOOKS RECOMMENDED :**

1. Robert L. Kruse; Data Structures and Program Design; Prentice Hall, 1987. (Second Edition).
2. A. S. Tanenbaum; Data Structure using C; PHI.
3. H. Sahani; Fundamentals of Data Structure in C; Orient Publications. (Second Edition).

## **PGDCAP7 Internet and Web Technology**

### **Introduction to internet**

Internet, Growth of internet, Anatomy of internet , History of WWW and basic internet terminologies ., Browsers , Electronic mail .

Internet Applications : Commerce on the internet , Governance on the internet , Impact of internet on society .

### **Internet technology and protocols**

What is networks ? Need of computer networks. Characteristics of LAN, MAN, WAN .

A brief idea of OSI reference model and TCP/IP . Difference between OSI and TCP/IP.

Physical topologies ( Bus , Ring , Tree , Star , Hybrid etc ..)

Logical topologies (protocols) A brief description of Ethernet, FDDI , ATM , Token ring

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### **File transfer protocol**

Introduction to FTP & terminologies, FTP servers and authentication, GUI based FTP clients, Browser based FTP clients.

### **Internet management security concepts:**

Overview of internet security, Firewalls. Internet security management concepts & information. Privacy & copyright issues.

### **HTML:**

Introduction to HTML, basics & elements of HTML, attributes, headings, paragraphs, links, Images, Lists, Tables, Forms, Frames

**Client side scripting:** Introduction to JavaScript & its basics, data types, variables operators, functions looping, objects, arrays, strings.

**Server side scripting:** Introduction to PHP, basic programming principles & database connectivity.

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### **BOOKS RECOMMENDED :**

1. HTML & XML an Introduction. PHI .
2. A. S. Godbole, A. Kahate; Web Technologies; Tata McGraw-hill;
3. Andrew S. Tanenbaum; Computer Network; PHI; (Fourth Edition);

# **PGDCAEL1 GUI Application Programming**

*Theory: 50 Marks*

## **Introduction:**

Basic idea of GUI based applications, advantages, IDE and its use; User Interface design principles, Event Driven Programming.

## **Review of Data Types Control Statements:**

Data Types, Variables & Constant, Arrays, Procedures, Methods, Arguments Passing, Functions Return Values. Control Flow Statements: - If-then, if-then-else, select case; Looping Statements- For, While, Do-while; and Nested Control Structure.

Multiple Document interface – Parent & child forms & method

## **Working With Forms & Standard Controls:**

Form designing; adding controls to forms: Text Box, Command Button, Combo Box, List Box, Radio buttons, Check boxes, Pull-down and Pop-up Menus, File list, other Controls.

Error Handling: - Types of errors, Error handling methods and Functions.

## **Graphics Controls:**

Graphics Controls, Image Handling, Coordinate System, Graphic methods- Text Drawing, Lines & Shape, Filling Shapes, and Grid Methods.

## **Database Connectivity:**

Connecting to databases; addition, retrieval, deletion, and updation of data into database tables; adding data controls in applications;

## **Practical: 50 Marks**

Practical application development using either .NET or Java.

At least 20 Practical assignments covering each of the topics mentioned in the theory part. Emphasis must be on developing full-fledged applications containing multiple forms and database connectivity.

## **BOOKS RECOMMENDED:**

1. J. Weber; Special Edition Using Java 2 Platform; PHI.
2. M. P. Bhawe, S. A. Patekar; Programming with Java; Pearson education.
3. Joshua Bloch; Effective Java: Programming Language Guide; Sun Microsystems.

## **PGDCAEL2 Computer Oriented Numerical Methods**

**Computer Arithmetic :** Floating point representation, single and double precision, arithmetic operations using normalised floating point numbers and their consequences, errors in number representation.

**Solution of non-linear equations:**

Bisection method & Newton's method, Regular falsi algorithm.

**Solution of simultaneous linear equations:**

Gauss elimination, Gauss-Jordan algorithm, Gauss Seidel method, pivoting strategy.

**Ordinary differential equations:**

Euler's method & Runge-Kutta method (2<sup>nd</sup> and 4<sup>th</sup> order).

**Numerical Integration:**

Trapezoidal rule & Simpsons rule.

**Interpolation and approximation:**

Polynomial interpolation, difference table and Calculus of differences, Lagrange's interpolation formula, least square approximation.

**Linear Programming:**

Formulation and solving linear programming problems, graphical method, Simplex method.

### **BOOKS RECOMMENDED**

1. B S Grewal; Numerical Methods; Khanna Publication; (Second Edition);
2. Veerarjan Ramachandran; Numerical Methods; Tata MacGraw Hill.(Second edition);
3. N K Jain , S R K Iyengar, R K Jain; Numerical methods for science and engineering Computation; New Age International (P) Ltd. (Fifth Edition);
4. A K Jaiswal, Anju Khandelwal; Computer Based Numerical and Statistical Techniques; New Age International; (First Edition).

## **PGDCAEL3 Computer Graphics**

Introduction : Types and Applications of computer graphics

Graphic Devices.

Input devices - Keyboard, Mouse, Trackball and Space ball, Joysticks, Data Glove, Digitizers, Image scanners, Touch Panels, Light pens.

Output devices - Raster Scan displays, Refresh CRT, Video Controller, Raster Scan display, Processor Digital frame buffer.

Penetration CRT, Color look-Up tables.

Flat panel displays

VGA and SVGA resolutions.

Output primitives and 2-d transformation

Line Driving Algorithms: DDA algorithms Bresenhan's Line Algorithm

Matrix representations and use of homogeneous coordinate systems. Translation, rotation, scaling, mirror reflection.

Rotation and scaling about an arbitrary point, composite transformation, Zooming and panning

Segmented curve and smooth curve drawing algorithm

Window and clipping

Clipping operations and algorithm

Filling

Concept of 3-D graphics

Hidden Surface removal

Introduction to Multimedia

### **BOOKS RECOMMENDED:**

1. D. Hearn, P. M. Baker; Computer Graphics; Prentice Hall of India, 1995; (2nd Edition);
2. D. F. Rogers; Procedural elements for Computer Graphics, McGraw Hill International.
3. Rogers, Adams; Mathematical Elements for Computer Graphics, McGraw Hill International
4. S. Harrington; Computer Graphics – A Programming; McGraw Hill Approach International; (Second Edition);

# **PGDCAEL4 Object Oriented Programming and C++**

## **1.Principles of Object Oriented Programming**

- 1.1 Basic concept of OOP,
- 1.2 Procedural programming vs OOP
- 1.3 Advantages of OOP, OOP languages
- 1.4 Concept of Class, Objects, Concept of Inheritance and encapsulation,
- 1.5 Operator overloading, Dynamic Binding.
- 1.6 Overview of OPP using C++,
- 1.7 Basic program construction.

## **2.Elements of C++ Language**

- 2.1 Keywords and Identifiers in C++
- 2.2 Variables and Constants,
- 2.3 Declaration and Initialization of Variables,
- 2.4 Concept of Dynamic Initialization of variables, Enumerated variables,
- 2.5 Basic Data Types,
- 2.6 Arrays and Strings, User Defined Data types,
- 2.7 Arithmetic, Relational, Logical Operators and Operator Precedence
- 2.8 Manipulators, Type Conversions and type cast operators
- 2.9 Console I/O: cin, cout functions.
- 2.10 Control Statements.-if; if-else; else...if; switch statements
- 2.11 Loops: for, while, do-while, Break, continue, go to

## **3.Functions**

- 3.1 Syntax of a Function.
- 3.2 Function Prototype, Calling function, Function definition
- 3.3 Passing arguments and returning values.
- 3.4 Pass by value, pass by reference.
- 3.5 Passing and returning structure variables
- 3.6 Inline and overloaded function
- 3.7 Default arguments, returning by reference.

## **4.Classes and Objects**

- 4.1 Definition and Declaration of a Class
- 4.2 Declaration of members.
- 4.3 Declaration of objects
- 4.4 Objects as function arguments.
- 4.5 Array of objects.
- 4.6 Returning objects from function.
- 4.7 Structures and classes.

## **5. Constructors and Destructors**

- 5.1 Concept of constructors. Types of constructors. Parameterized constructor, Constructor with default arguments, Copy constructors
- 5.2 Dynamic Initialization of Objects .
- 5.3 Concept of Destructors.

## **6 Operator Overloading**

- 6.1 Concept of Operator Overloading
- 6.2 Unary and Binary Operators.
- 6.3 Overloading of unary and binary operators.

## **7. Derived Classes and Inheritance**

- 7.1 Concept of inheritance
- 7.2 Derived and Base Class- Definition and Declaration.
- 7.3 Types of Inheritance.
- 7.4 Public, Private and Protected Access
- 7.5 Constructors in Derives Classes

## **8. Pointers**

- 8.1. Pointer Basics.
- 8.2. Address Operator and Pointer Variables.
- 8.3. Pointer Arithmetic.
- 8.4. New And Delete Operator
- 8.5. Null Pointer.
- 8.6. Reference and Constant pointer.
- 8.7. Array of Pointers.
- 8.8. Pointers to Object and Pointers to Pointer.

## **9. Virtual Function & Polymorphism**

- 9.1 Pointers to Derived Objects and Virtual Functions.
- 9.2 Early binding vs. Late binding.
- 9.3 Abstract Classes and Pure Virtual Function.

## **BOOKS RECOMMENDED:**

1. Robert Laffore; Object Oriented Programming in Turbo C++; Galgotia Publication,1996; (Fourth Edition).
2. E. Balaguruswamy; Object Oriented Programming with C++;Tata McGrahill, 1997; (Third Edition) ;
3. Yashavant Kanitkar; Visual C++ Programming; BPB Publications,1998.
4. S.B. Lippman; C++ Primer; Addison Wesley, 1995 ; (Third Edition).
5. Stastroup; The Elements of C++ Programming; Addison Weiley Publication, 1995.