**General Elective Papers (GE) (Minor – Computer Science) for other Departments/Disciplines: (Credit: 06 each)**

**North Lakhimpur College (Autonomous)**

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# GE – 1 Introduction to Programming

**Introduction to C and C++**

History of C and C++, Overview of Procedural Programming and Object-Orientation Programming, Using main() function, Compiling and Executing Simple Programs in C++.

**Data Types, Variables, Constants, Operators and Basic I/O**

Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise), Using Comments in programs, Character I/O (getc, getchar, putc, putcharetc), Formatted and Console I/O (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h, conio.hetc).

**Expressions, Conditional Statements and Iterative Statements**

Simple Expressions in C++ (including Unary Operator Expressions, Binary Operator Expressions), Understanding Operators Precedence in Expressions, Conditional Statements (if construct, switch-case construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops), Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative)

**Functions and Arrays**

Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments.

Creating and Using One Dimensional Arrays ( Declaring and Defining an Array, Initializing an Array, Accessing individual elements in an Array, Manipulating array elements using loops), Use Various types of arrays (integer, float and character arrays / Strings) Two-dimensional Arrays (Declaring, Defining and Initializing Two Dimensional Array, Working with Rows and Columns), Introduction to Multi-dimensional arrays

**Derived Data Types (Structures and Unions)**

Understanding utility of structures and unions, Declaring, initializing and using simple structures and unions, Manipulating individual members of structures and unions, Array of Structures, Individual data members as structures, Passing and returning structures from functions, Structure with union as members, Union with structures as members.

**File I/O, Preprocessor Directives**

Opening and closing a file (use of fstream header file, ifstream, ofstream and fstream classes), Reading and writing Text Files, Using put(), get(), read() and write() functions, Random access in files, Understanding the Preprocessor Directives (#include, #define, #error, #if, #else, #elif, #endif, #ifdef, #ifndef and #undef), Macros

**Using Classes in C++**

Principles of Object-Oriented Programming, Defining & Using Classes, Class Constructors, Constructor Overloading, Function overloading in classes, Class Variables &Functions, Objects as parameters, Specifying the Protected and Private Access, Copy Constructors, Overview of Template classes and their use.

**Inheritance and Polymorphism**

Introduction to Inheritance and Polymorphism

**Reference Books:**

1. Herbtz Schildt, "C++: The Complete Reference", Fourth Edition, McGraw Hill.

2. E Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill Education, 2008.

3. Paul Deitel, Harvey Deitel, "C++ How to Program", 8th Edition, Prentice Hall, 2011.

4. John R. Hubbard, "Programming with C++", Schaum's Series, 2nd Edition, 2000.

5. Harry, H. Chaudhary, "Head First C++ Programming: The Definitive Beginner's Guide", First Create space Inc, O-D Publishing, LLC USA.

## Introduction to Programming Lab

**Practical: 60 lectures**

1. WAP to print the sum and product of digits of an integer.
2. WAP to reverse a number.
3. WAP to compute the sum of the first n terms of the following series S = 1+1/2+1/3+1/4+……
4. WAP to compute the sum of the first n terms of the following series S =1-2+3-4+5……………
5. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
6. Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.
7. WAP to compute the factors of a given number.
8. Write a macro that swaps two numbers. WAP to use it.
9. WAP to perform following actions on an array entered by the user:
   1. Print the even-valued elements
   2. Print the odd-valued elements
   3. Calculate and print the sum and average of the elements of array
   4. Print the maximum and minimum element of array
   5. Remove the duplicates from the array
   6. Print the array in reverse order

The program should present a menu to the user and ask for one of the options. The menu should also include options to re-enter array and to quit the program.

1. Write a macro that swaps two numbers. WAP to use it.
2. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
3. Write a program that swaps two numbers using pointers.
4. Write a program in which a function is passed address of two variables and then alter its contents.
5. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.
6. Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc() / calloc() functions or new operator.
7. Write a menu driven program to perform following operations on strings:
   1. Show address of each character in string
   2. Concatenate two strings without using strcat function.
   3. Concatenate two strings using strcat function.
   4. Compare two strings
   5. Calculate length of the string (use pointers)
   6. Convert all lowercase characters to uppercase
   7. Convert all uppercase characters to lowercase
   8. Calculate number of vowels
   9. Reverse the string
8. Write a menu driven program to perform following operations on strings:
9. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.
10. WAP to display Fibonacci series (i)using recursion, (ii) using iteration
11. WAP to calculate Factorial of a number (i)using recursion, (ii) using iteration
12. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.
13. Create Matrix class using templates. Write a menu-driven program to perform following Matrix operations (2-D array implementation):
14. Sum b) Difference c) Product d) Transpose
15. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).
16. Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.
17. Create a class Box containing length, breath and height. Include following methods in it:
    1. Calculate surface Area
    2. Calculate Volume
    3. Increment, Overload ++ operator (both prefix & postfix)
    4. Decrement, Overload -- operator (both prefix & postfix)
    5. Overload operator == (to check equality of two boxes), as a friend function
    6. Overload Assignment operator
    7. Check if it is a Cube or cuboid

Write a program which takes input from the user for length, breath and height to test the above class.

1. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
2. Write a program to retrieve the student information from file created in previous question and print it in following format: *Roll No. Name Marks*
3. Copy the contents of one text file to another file, after removing all whitespaces.
4. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void.
5. Write a program that will read 10 integers from user and store them in an array. Implement array using pointers. The program will print the array elements in ascending and descending order.

# GE- 2 Introduction to Database System

**Theory: 60 lectures Database:** Introduction to database, relational data model, DBMS architecture, data independence, DBA, database users, end users, front end tools

**E-R Modeling:** Entity types, entity set, attribute and key, relationships, relation types, E- R diagrams, database design using ER diagrams

**Relational Data Model:** Relational model concepts, relational constraints, primary and foreign key, normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF

**Structured Query Language:** SQL queries, create a database table, create relationships between database tables, modify and manage tables, queries, forms, reports, modify, filter and view data.

**Reference Books :**

1. P. Rob, C. Coronel, Database System Concepts by, Cengage Learning India, 2008

2. R. Elmsasri,S. Navathe Fundamentals of Database Systems, Pearson Education, Fifth

Edition, 2007

3. MySQL : Reference Manual

## Introduction to Database System Lab

***1)*** Create a database having two tables with the specified fields, to computerize a library system of a Delhi University College.

**LibraryBooks (Accession number, Title, Author, Department, PurchaseDate, Price)**

**IssuedBooks (Accession number, Borrower)**

1. Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
2. Delete the record of book titled “Database System Concepts”.
3. Change the Department of the book titled “Discrete Maths” to “CS”.
4. List all books that belong to “CS” department.
5. List all books that belong to “CS” department and are written by author “Navathe”.
6. List all computer (Department=”CS”) that have been issued.
7. List all books which have a price less than 500 or purchased between “01/01/1999” and “01/01/2004”.

***2)*** Create a database having three tables to store the details of students of Computer Department in your college.

**Personal information about Student (College roll number, Name of student, Date of birth, Address, Marks(rounded off to whole number) in percentage at 10 + 2, Phone number)**

**Paper Details (Paper code, Name of the Paper)**

**Student’s Academic and Attendance details (College roll number, Paper code, Attendance, Marks in home examination).**

1. Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
2. Design a query that will return the records (from the second table) along with the name of student from the first table, related to students who have more than 75% attendance and more than 60% marks in paper 2.
3. List all students who live in “Delhi” and have marks greater than 60 in paper 1.
4. Find the total attendance and total marks obtained by each student.
5. List the name of student who has got the highest marks in paper 2.

***3)*** Create the following tables and answer the queries given below:

**Customer (CustID, email, Name, Phone, ReferrerID)**

**Bicycle (BicycleID, DatePurchased, Color, CustID, ModelNo)**

**BicycleModel (ModelNo, Manufacturer, Style)**

**Service (StartDate, BicycleID, EndDate)**

1. Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
2. List all the customers who have the bicycles manufactured by manufacturer “Honda”.
3. List the bicycles purchased by the customers who have been referred by customer “C1”.
4. List the manufacturer of red colored bicycles.
5. List the models of the bicycles given for service.

***4)*** Create the following tables, enter at least 5 records in each table and answer the queries given below.

**EMPLOYEE ( Person\_Name, Street, City )**

**WORKS ( Person\_Name, Company\_Name, Salary )**

**COMPANY ( Company\_Name, City )**

**MANAGES ( Person\_Name, Manager\_Name )**

1. Identify primary and foreign keys.
2. Alter table employee, add a column “email” of type varchar(20).
3. Find the name of all managers who work for both Samba Bank and NCB Bank.
4. Find the names, street address and cities of residence and salary of all employees who work for “Samba Bank” and earn more than $10,000.
5. Find the names of all employees who live in the same city as the company for which they work.
6. Find the highest salary, lowest salary and average salary paid by each company.
7. Find the sum of salary and number of employees in each company.
8. Find the name of the company that pays highest salary.

***5)*** Create the following tables, enter at least 5 records in each table and answer the queries given below.

**Suppliers (SNo, Sname, Status, SCity)**

**Parts (PNo, Pname, Colour, Weight, City)**

**Project (JNo, Jname, Jcity)**

**Shipment (Sno, Pno, Jno, Qunatity)**

1. Identify primary and foreign keys.
2. Get supplier numbers for suppliers in Paris with status>20.
3. Get suppliers details for suppliers who supply part P2. Display the supplier list in increasing order of supplier numbers.
4. Get suppliers names for suppliers who do not supply part P2.
5. For each shipment get full shipment details, including total shipment weights.
6. Get all the shipments where the quantity is in the range 300 to 750 inclusive.
7. Get part nos. for parts that either weigh more than 16 pounds or are supplied by suppliers S2, or both.
8. Get the names of cities that store more than five red parts.
9. Get full details of parts supplied by a supplier in Delhi.
10. Get part numbers for part supplied by a supplier in Allahabad to a project in Chennai.
11. Get the total number of project supplied by a supplier (say, S1).
12. Get the total quantity of a part (say, P1) supplied by a supplier (say, S1).

# GE- 3 Computer Networks and Internet Technologies

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| --- |
| **Theory: 60 lectures Computer Networks:** Introduction to computer network, data communication, components of data communication, data transmission mode, data communication measurement, LAN, MAN, WAN, wireless LAN, internet, intranet, extranet.  **Network Models:** Client/ server network and Peer-to-peer network  OSI & TCP/IP: layers and functionalities.    **Transmission Media:** Introduction, Guided Media: Twisted pair, Coaxial cable, Optical fiber. Unguided media: Microwave, Radio frequency propagation. |
| **Satellite.**  **LAN Topologies: Ring, bus, star, mesh and tree topologies.**  Network Devices: NIC, repeaters, hub, bridge, switch, gateway and router.  Internet Terms: Web page, Home page, website, internet browsers, URL, Hypertext, ISP, Web server, download and upload, online and offline.  **Internet Applications:** www, telnet, ftp, e-mail, social networks, search engines, Video Conferencing, e-Commerce, m-Commerce, VOIP, blogs.  **Introduction to Web Design**: Introduction to hypertext markup language (html) Document type definition, creating web pages, lists, hyperlinks, tables, web forms, inserting images, frames, hosting options and domain name registration. Customized Features: Cascading style sheet (css) for text formatting and other manipulations.  **JavaScript Fundamentals:** Data types and variables, functions, methods and events, controlling program flow, JavaScript object model, built-in objects and operators. |

**Reference Books:**

1. Computer networks – Tannenbaum

2. Data Communication and Networking – Forouzan – Tata McGraw Hill.

3. D.R. Brooks, An Introduction to HTML and Javascript for Scientists and Engineers, Springer W. Willard, 4.HTML A Beginner's Guide, Tata McGraw-Hill Education, 2009.

4. J. A. Ramalho, Learn Advanced HTML 4.0 with DHTML, BPB Publications, 2007

## Computer Networks and Internet Technologies Lab

Practical exercises based on concepts listed in theory using HTML.

1. Create HTML document with following formatting – Bold, Italics, Underline, Colors, Headings, Title, Font and Font Width, Background, Paragraph, Line Brakes, Horizontal Line, Blinking text as well as marquee text.

2. Create HTML document with Ordered and Unordered lists, Inserting Images, Internal and External linking

3. Create Form with Input Type, Select and Text Area in HTML.

4. Create an HTML containing Roll No., student’s name and Grades in a tabular form.

**List of Practicals using Scratch : (self-learning by students)**

3. Join the Scratch community on scratch.mit.edu. Explore featured projects and modify any one of them.

4. Create a game using SCRATCH similar to that of Beach Baby Volleyball. The game MUST meet the following objectives.

5. Create a website of 6 – 7 pages with different effects as mentioned in above problems.

• Have at least 3 sprites. All of which move, bounce, fall, etc. 10 pts.

• Edit at least one of the sprites in some way to make it your own. 10 pts.

• Make some or all sprites move with the use of certain keys. 15 pts.

• Create or use a given background on your game. 10 pts.

• Incorporate sound into your game. 10 pts.

• Use a counter or score keeper in your game. 15 pts.

• Must include a forever loop, show, hide, and “when I receive.” 30 pts.

**List of Practicals using Javascript :**

Create event driven program for following:

1. Print a table of numbers from 5 to 15 and their squares and cubes using alert.

2. Print the largest of three numbers.

3. Find the factorial of a number n.

4. Enter a list of positive numbers terminated by Zero. Find the sum and average of these numbers.

5. A person deposits Rs 1000 in a fixed account yielding 5% interest. Compute the amount in the account at the end of each year for n years.

6. Read n numbers. Count the number of negative numbers, positive numbers and zeros in the list.

# GE 4: Information Security and Cyber Laws Course

**1. Introduction:** Computer network as a threat, hardware vulnerability, software vulnerability, importance of data security.

**2. Digital Crime:** Overview of digital crime, criminology of computer crime.

**3. Information Gathering Techniques:** Tools of the attacker, information and cyber warfare, scanning and spoofing, password cracking, malicious software, session hijacking

**4. Risk Analysis and Threat:** Risk analysis, process, key principles of conventional computer security, security policies, authentication, data protection, access control, internal vs external threat, security assurance, passwords, authentication, and access control, computer forensics and incident response

**5. Introduction to Cryptography and Applications :** Important terms, Threat, Flaw, Vulnerability, Exploit, Attack, Ciphers, Codes, Substitution Cipher (Caeser), Transposition Cipher (Rail-Fence), Public key cryptography (Definitions only), Private key cryptography (Definition and Example), Cyber forensics, Steganography

**6. Safety Tools and Issues :** Firewalls, logging and intrusion detection systems, Windows and windows XP / NT security, Unix/Linux security, ethics of hacking and cracking

**7. Cyber laws to be covered as per IT 2008:**

• Chapter 1: Definitions

• Chapter 2: Digital Signature And Electronic Signature

• [Section 43] Penalty and Compensation for damage to computer, computer system, etc.

• [Section 65] Tampering with Computer Source Documents

• [Section 66 A] Punishment for sending offensive messages through communication service, etc.

• [Section 66 B] Punishments for dishonestly receiving stolen computer resource or communication device

• [Section 66C] Punishment for identity theft

• [Section 66D] Punishment for cheating by personation by using computer resource

• [Section 66E] Punishment for violation of privacy

• [Section 66F] Punishment for cyber terrorism

• [Section 67] Punishment for publishing or transmitting obscene material in electronic form

• [Section 67A] Punishment for publishing or transmitting of material containing sexually explicit act, etc. in electronic form[Section 67B] Punishment for publishing or transmitting of material depicting children in sexually explicit act, etc. in electronic form

• [Section 72] Breach of confidentiality and privacy

**Reference Books:**

1. M. Merkow, J. Breithaupt, Information Security Principles and Practices, Pearson

Education.

2. G.R.F. Snyder, T. Pardoe, Network Security, Cengage Learning, 2010

3. A. Basta, W.Halton, Computer Security: Concepts, Issues and Implementation,

Cengage Learning India, 2008

4. Anderson, Ross. Security engineering. John Wiley & Sons, 2008. (Freely available online)

## Practical:

1. Demonstrate the use of Network tools: ping, ipconfig, ifconfig, tracert, arp, netstat, whois

2. Use of Password cracking tools : John the Ripper, Ophcrack. Verify the strength of passwords using these tools.

3. Use nmap/zenmap to analyse a remote machine.

4. Use Burp proxy to capture and modify the message.

5. Demonstrate sending of a protected word document.

6. Demonstrate sending of a digitally signed document.

7. Demonstrate sending of a protected worksheet.

8. Demonstrate use of steganography tools.

9. Demonstrate use of gpg utility for signing and encrypting purposes.