

Standard Operating Procedures (SOPs) for Computer Science Labs

Program: Bachelor of Computer Applications (BCA)

PG Department of Computer Science, Sri Guru Teg Bahadur Khalsa College, Sri Anandpur Sahib

Lab Configuration Reference (MCA Lab-I) Room 502

Hardware Model: Lenovo Thinkcenter Neo 5

Processing Unit: Intel Core i5, 12th Generation, 3.00 GHz

Memory Capacity: 8 GB DDR5 RAM

SSD : 500 GB

Lab Capacity: 20 active workstations

Core Languages Installed: C/C++, Java, Python, R

Web Technologies Installed: HTML, CSS, JavaScript, Bootstrap, Node.js, PHP

IDE & Tooling Installed: VS Code, CLion, Eclipse, Jupyter, Spyder, RStudio, WAMP Server

General Instructions & Lab Conduct Rules (applicable to all subjects below)

- Students must carry their identity card and lab record file/notebook to every lab session.
- Bags and personal belongings should be kept in the designated area, not on workstations.
- Food, drinks, and use of mobile phones (except for academic reference, with faculty permission) are not allowed inside the lab.
- Students must not install, download, or copy unauthorized software or files on lab systems.
- Any hardware/software malfunction must be reported immediately to the lab attendant/faculty.
- Students must save their work at regular intervals and are responsible for maintaining backups of their own work.
- Data/programs of one student must not be copied from another; plagiarism in lab records will be dealt with as per college norms.
- Electrical points, UPS, and networking equipment should not be tampered with.
- Log-in and log-out timings should be maintained in the lab attendance/usage register.
- The last user must shut down the system properly and switch off peripherals before leaving.

Semester 1

Fundamentals of Information Technology

Semester: 1st Semester

Program: Bachelor of Computer Applications (BCA)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: MS-Word, MS-PowerPoint, MS-Excel (MS Office Suite)

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Activities

I. MS-Word

- Activity 1: Create, open, save and close a document; typing, copying, moving and deleting data; Save/Save as, Cut/Copy, Paste/Paste Special.
- Activity 2: Formatting data — text formatting (font size, style, color, subscript, superscript, case), alignment, character spacing, indentation, line spacing, borders/shading, bullets and numbering.
- Activity 3: Find and replace, data sorting, protecting the document, adding charts, page size/margin/orientation, hyphenation, columns and line numbers.
- Activity 4: Page color, page border, themes, watermarks; adding tables, headers/footers, pictures, page numbers, special symbols, text boxes; ruler, gridlines, document map, thumbnails, WordArt, drop cap, hyperlink, equation.
- Activity 5: Arranging/splitting windows, mail merge, creating and running macros, setting print properties.

II. PowerPoint

- Activity 1: Create, open, save and close a presentation; typing, copying, moving, deleting data; new slide, slide layout, adding/deleting slides.
- Activity 2: Formatting data in slides — text formatting, alignment, character spacing, indentation, line spacing, borders/shading, bullets and numbering.
- Activity 3: Slide size/margin/orientation; adding tables, headers/footers, pictures, page numbers, special symbols, text boxes.
- Activity 4: Adding animation and transition effects, slide show, presentation views, formatting commands.
- Activity 5: Creating and running macros, arranging/splitting windows.

III. MS-Excel

- Activity 1: Create, open, save, close workbook; create/rename/move worksheet; entering, copying, moving, deleting data; insert/delete cells, columns, rows.
- Activity 2: Formatting data in cells — text formatting, cell borders, alignment, text orientation, direction, control.
- Activity 3: Find and replace, data sorting and filtering, protecting worksheet/workbook, basic formulas.
- Activity 4: Basic functions, creating charts, page size/margin/orientation, print properties.
- Activity 5: Hide/unhide rows and columns, set column width/row height, add text box/headers/footers/pictures/special symbols, arranging/splitting/hiding windows, freezing panes, macros.

Web Designing Using HTML

Semester: 1st Semester

Program: Bachelor of Computer Applications (BCA)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: HTML, CSS / VS Code / Web Browser

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Create a web page to show the structure of HTML.
2. Show the use of formatting tags in HTML.
3. Write HTML code to show the use of absolute and relative URL with anchor tag.
4. Show the use of image tag and show images as buttons.
5. Create a web page to show the use of image maps.
6. Create a table in which colspan and rowspan elements are used.
7. Create a webpage to show the use of different lists available in HTML.
8. Create a webpage to show the use of frame tag in HTML.
9. Create admission form for a college.

Semester 2

Programming Fundamentals Using C

Semester: 2nd Semester

Program: Bachelor of Computer Applications (BCA)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: GCC / VS Code / CLion

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Write a program to print the size of all the data types supported by C and its range.
2. Write a program to convert temperature from Fahrenheit to Celsius.
3. Write a program to find simple interest and compound interest.
4. Write a program to check whether the given number is an even number or not.
5. Write a program to accept three numbers and find the largest among them.
6. Write a program to count the different vowels in a line of text using switch.
7. Write a program to accept two numbers and perform various arithmetic operations (+, -, *, /) based on the symbol entered.
8. Write a program to find factorial of a number.
9. Write a program to check whether a number is prime or not.
10. Write a program to print all prime numbers between any 2 given limits.
11. Write a program to check whether a number is palindrome or not.
12. Write a program to print all the Armstrong numbers between any 2 given limits.
13. Write a program to find largest element in an array.
14. Write a program to find sum and average of numbers stored in an array.
15. Write a program to check whether a string is a Palindrome.
16. Write a program to perform matrix addition.
17. Write a program to perform matrix multiplication.
18. Write a program to find the roots of a quadratic equation using function.
19. Write a recursive program to find the factorial of a number.
20. Write a recursive program to find the nth Fibonacci number.
21. Create an employee structure and display the same.
22. Create a student database storing the roll no, name, class etc. and sort by name.
23. Write a function to swap two numbers using pointers.
24. Write a program to access an array of integers using pointers.
25. Create a file and store some records in it. Display the contents of the same. Count numbers of characters, words and lines in the file.

Operating Systems

Semester: 2nd Semester

Program: Bachelor of Computer Applications (BCA)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: Windows OS environment (installation & administration)

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Installation of Windows Operating System.
2. Working with files: saving and closing a file.
3. Mouse mechanisms: click, double click, drag and drop method.
4. Installation of new software.
5. Control Panel.
6. Accessories.
7. Network Neighborhood.
8. System Tools.
9. Recycle Bin.
10. Files & directory management under Windows.

Semester 3

Object Oriented Programming using C++

Semester: 3rd Semester

Program: Bachelor of Computer Applications (BCA)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: G++ / VS Code / CLion

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Write a program to find area of rectangle using the concept of classes & object.
2. Write a program to read 2 integers and perform simple arithmetic operations using pointer technique (use new and delete operators).
3. Write a program to show the use of friend function.
4. Write a program to show the use of constructor overloading.
5. Write a program to show the use of copy constructor.
6. Write a program to show the use of destructors.
7. Write a program to show the use of virtual function.
8. Write a program to implement the concept of multilevel inheritance.
9. Write a program to implement the concept of multiple inheritance.
10. Write a program of unary operator overloading.
11. Write a program of binary operator overloading.
12. Develop an object-oriented program in C++ to read emp name, emp code, designation, experience and age; construct the database with suitable member functions using constructor, destructor and dynamic memory allocation operators new and delete.
13. Write a program in C++ to prepare a mark sheet of a university exam by reading student name, roll no, subject name, subject code, internal marks, external marks. Design a base class with data members student name, roll no, sub name; derived class with sub code, internal marks, external marks; construct the program to search for and print a record.

Data Structure

Semester: 3rd Semester

Program: Bachelor of Computer Applications (BCA)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: C/C++ compiler / VS Code / CLion

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.

- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Program to insert and delete an element from an array.
2. Write a program to find largest and smallest elements in an array.
3. Write a program to add and subtract two matrices.
4. Write a program to multiply and transpose two matrices.
5. Program to apply various operations on stack.
6. Program for parenthesis matching using stack.
7. Program for string reversal using stack.
8. Program to insert and delete nodes in a queue.
9. Program to insert and delete nodes in a linked list.
10. Program to search a node in a linked list.
11. Program to insert or delete node in a binary tree.
12. Program to traverse binary tree.
13. Write a program using ADT to perform linear search.
14. Write a program using ADT to perform binary search.
15. Write a program in C++ to implement Bubble sort and Selection sort.
16. Write a program in C++ to implement Quick sort.
17. Program for implementing Insertion sort.
18. Program for implementing Merge sort.

Relational Database Management System

Semester: 3rd Semester

Program: Bachelor of Computer Applications (BCA)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: MySQL (via WAMP Server) / VS Code

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Creating the table.
2. Querying the record using ORDER BY clause.
3. Querying the record using GROUP BY clause.
4. Querying the record using multiple conditions.
5. Create synonyms.
6. Create sequences.
7. Create views.
8. Create indexes.
9. Create triggers.

Semester 4

Workshop on Adobe Photoshop

Semester: 4th Semester

Program: Bachelor of Computer Applications (BCA)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: Adobe Photoshop

Additional Requirement / Note: Adobe Photoshop is not part of the standard MCA Lab-I software list; requires licensed installation prior to sessions.

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Installation of Adobe Photoshop in Windows.
2. Introduction of various tools.
3. Creating and opening a document in Adobe Photoshop.
4. Understanding different image file formats.
5. Working with multiple images and understanding rules and grids.
6. Creating multicolor images.
7. Familiarization with cropping, rotating and overlapping photos on a page.
8. Understanding layers — creating, selecting, editing, locking and grouping layers.
9. Understanding layer styles, layer mask and consolidating layers.
10. Photoshop filters.
11. Familiarization with various effects of filters.

Programming using Java

Semester: 4th Semester

Program: Bachelor of Computer Applications (BCA)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: JDK / Eclipse / VS Code

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Write a Class Date that takes day, month, and year while creating an object of this class; find a new date when the number of days is given.
2. Write a program to implement Boolean AND, OR, XOR, and NOT operations.
3. Write a program to add, subtract and multiply two matrices using a switch statement; validate the sizes of the two matrices before performing any operation and raise an exception if the operation cannot be performed.
4. Write a program to store and then print sorted names of students according to the length of the name, using arrays with variable-sized rows.
5. Write a program to find the area of all types of triangles using constructor overloading and inheritance depending on the number of dimensions given in the input, using super to call the superclass constructor.
6. Write a program to find the area of a rectangle using an abstract superclass Figure, overriding the method used to compute the area.
7. Write a program to implement a growable and shrinkable Stack supporting push, pop, and view-top operations with dynamic allocation using the finalize() method; incorporate private and public access methods to avoid accidental manipulation of the stack.
8. Write a program to demonstrate static variables, methods and blocks.
9. Write a program to swap two items belonging to an object using return of an object by a function.
10. Write a program to count the frequency of each vowel in a given string.
11. Demonstrate the use of static and non-static nested classes.
12. Create a package containing a class to print name, roll no, and marks, and use this package in another program using the import statement.

Semester 5

Web Designing using ASP.NET

Semester: 5th Semester

Program: Bachelor of Computer Applications (BCA)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: Visual Studio, ASP.NET, SQL Server

Additional Requirement / Note: Visual Studio / ASP.NET / SQL Server are not part of the standard MCA Lab-I software list; requires separate installation prior to sessions.

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Write a program to show the use of standard controls in a web form.
2. Write a program containing the list controls and their functions.
3. Write a program to show the use of file upload and calendar control.
4. Write a program to display advertisement on a web page.
5. Write a program to create an admission form for a college.
6. Write a program to demonstrate the master page.
7. Write a program to create a login page which accepts user name and password, then checks for authentication of the user.
8. Write a program that demonstrates a textbox for user input name and validates it using Required Field Validation.
9. Create a user control that displays the current date and time; include it in a Web Form and refresh it each time a button is clicked.
10. Create a user control that receives the user name and password and validates them (authorized if username is "Radiant" and password is "asp.net", otherwise not).
11. Write a program to demonstrate ADO.NET controls.
12. Write a program to demonstrate submitting data to a database using ADO.NET controls.

Computer Graphics

Semester: 5th Semester

Program: Bachelor of Computer Applications (BCA)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: C/C++ with Graphics library (graphics.h) / Turbo C or equivalent / VS Code

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.

- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Write a program to draw a pixel.
2. Write a program to draw a vertical line and a horizontal line.
3. Write a program to draw a line using Bresenham's algorithm.
4. Write a program to draw a line using DDA algorithm.
5. Write a program to draw a 2D bar and a 3D bar.
6. Write a program to draw a 3D bar graph using graphics.
7. Write a program to draw an arc, circle and rectangle.
8. Draw a circle using the trigonometric method and Bresenham's algorithm.
9. Write a program to draw animation using increasing circles filled with different colors and patterns.
10. Program to show 2-D scaling.
11. Write a program to implement a digital clock.

Linux Administration

Semester: 5th Semester

Program: Bachelor of Computer Applications (BCA)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: Linux Terminal (Ubuntu/CentOS environment or VM)

Additional Requirement / Note: Requires a Linux environment (dual-boot, VM, or WSL) in addition to the standard Windows configuration listed above.

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Commands: pwd, cd, mkdir, cat, more, less, head, tail, ls, date, cal, rmdir, mv, rm, cp.
2. Demonstration of chmod command.
3. How to list hidden files/directories.
4. How to skip current (.) and previous (..) directory entries in the output.
5. How to display files/directories in reverse order.
6. How to sort ls command output based on file extensions.
7. How to sort files based on modification time.
8. How to list subdirectories recursively.
9. How to list filenames along with their inode numbers.
10. How to display detailed information about files and directories.
11. How to display author information.
12. Setting the system name.
13. Forgetting the root password.
14. Shutting down Linux.

Semester 6

Web Development using PHP & MySQL

Semester: 6th Semester

Program: Bachelor of Computer Applications (BCA)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: PHP, MySQL / WAMP Server / VS Code

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
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List of Experiments

1. Write a program to print any text in PHP.
2. Write a program to print the data types of PHP i.e. String, Integer, Floating point numbers, Boolean, Array, Object, NULL.
3. Write a program of arithmetic operators.
4. Write a program using conditional statements.
5. Write a program to implement switch case in PHP.
6. Write a program to add two numbers using functions.
7. Write a program to implement while loop.
8. Print different values using for-each loop.
9. Create a date from a string with PHP strtotime() function.
10. Write a program to open, read and close a file in PHP.
11. Write a function to connect and create a database using PHP.
12. Write a program to implement the mail function.
13. Write a program to implement WHERE clause in PHP-MySQL.
14. Write a program to implement file upload using PHP.
15. Write a program to start, store and delete a session variable.

Programming using Python

Semester: 6th Semester

Program: Bachelor of Computer Applications (BCA)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: Python 3.x / VS Code / Jupyter / Spyder

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- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
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List of Experiments

1. Write a program to perform arithmetic operations.
2. Write a program to display various types and their values.
3. Write a program to display string operations.
4. Write a program to find area of rectangle.
5. Write a program to find cube.
6. Write a program to compare two numbers as greater, smaller and equal.
7. Write a program to find greater of three numbers.
8. Write a program to find grade of a student.
9. Write a program to implement for loop.
10. Write a program to print the even numbers up to a given range.
11. Write a program to find sum of first n numbers.
12. Write a program to find factorial of first n numbers.
13. Write a program to display the pyramid.
14. Write a program to display matrix addition.
15. Write a program to display matrix multiplication.
16. Write a program to create a list of 10 numbers, multiply each element by 2, and display the list.
17. Write a program to create a dictionary and display it.
18. Write a program to add, delete and iterate the dictionary.
19. Write a program to find the cube of a number using function.
20. Write a program to find area of rectangle using function.
21. Write a program to make a class.
22. Write a program to show the concept of overriding.

Standard Operating Procedures (SOPs) for Computer Science Labs

Program: B.Sc.(Hons.) Artificial Intelligence & Data Science

PG Department of Computer Science, Sri Guru Teg Bahadur Khalsa College, Sri Anandpur Sahib

Lab Configuration Reference (DBT Lab-I)

Hardware Model: Dell Optiplex 3470

Processing Unit: Intel Core i5, 12th Generation, 3.00 GHz

Memory Capacity: 8 GB DDR4 RAM

SSD : 256 GB

Lab Capacity: 10 active workstations

Core Languages Installed: C/C++, Java, Python, R

Web Technologies Installed: HTML, CSS, JavaScript, Bootstrap, Node.js, PHP

IDE & Tooling Installed: VS Code, CLion, Eclipse, Jupyter, Spyder, RStudio, WAMP Server

General Instructions & Lab Conduct Rules (applicable to all subjects below)

- Students must carry their identity card and lab record file/notebook to every lab session.
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- Any hardware/software malfunction must be reported immediately to the lab attendant/faculty.
- Students must save their work at regular intervals and are responsible for maintaining backups of their own programs.
- Data/programs of one student must not be copied from another; plagiarism in lab records will be dealt with as per college norms.
- Electrical points, UPS, and networking equipment should not be tampered with.
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Semester 1

Problem Solving and Programming in C

Semester: 1st Semester

Program: B.Sc.(Hons.) Artificial Intelligence & Data Science

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: GCC / VS Code / CLion (C compiler toolchain)

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment objective, relevant concepts, and expected output.
- Students write/type the program or query in the designated IDE/editor listed above.
- Students compile/execute the program or run the query and observe the output.
- Errors, if any, are debugged with guidance from the lab instructor.
- Verified output is shown to the faculty/lab instructor for checking.
- Program/query and output are recorded in the lab file / record register (handwritten or printed as per department norms).
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Write a program to print the size of all the data types supported by C and its range.
2. Write a program to convert temperature from Fahrenheit to Celsius.
3. Write a program to find simple interest and compound interest.
4. Write a program to check whether the given number is an even number or not.
5. Write a program to accept three numbers and find the largest among them.
6. Write a program to count the different vowels in a line of text using switch.
7. Write a program to accept two numbers and perform various arithmetic operations (+, -, *, /) based on the symbol entered.
8. Write a program to find factorial of a number.
9. Write a program to check whether a number is prime or not.
10. Write a program to print all prime numbers between any 2 given limits.
11. Write a program to check whether a number is palindrome or not.
12. Write a program to print all the Armstrong numbers between any 2 given limits.
13. Write a program to find largest element in an array.
14. Write a program to find sum and average of numbers stored in an array.
15. Write a program to check whether a string is a Palindrome.
16. Write a program to perform matrix addition.
17. Write a program to perform matrix multiplication.
18. Write a program to find the roots of a quadratic equation using function.
19. Write a recursive program to find the factorial of a number.
20. Write a recursive program to find the nth Fibonacci number.
21. Create an employee structure and display the same.
22. Create a student database storing the roll no, name, class etc. and sort by name.
23. Write a function to swap two numbers using pointers.
24. Write a program to access an array of integers using pointers.
25. Create a file and store some records in it. Display the contents of the same. Count numbers of characters, words and lines in the file.

Semester 2

Object Oriented Programming Concepts using C++

Semester: 2nd Semester

Program: B.Sc.(Hons.) Artificial Intelligence & Data Science

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: G++ / VS Code / CLion

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment objective, relevant concepts, and expected output.
- Students write/type the program or query in the designated IDE/editor listed above.
- Students compile/execute the program or run the query and observe the output.
- Errors, if any, are debugged with guidance from the lab instructor.
- Verified output is shown to the faculty/lab instructor for checking.
- Program/query and output are recorded in the lab file / record register (handwritten or printed as per department norms).
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Write a program to find area of rectangle using the concept of classes & object.
2. Write a program to read 2 integers and perform simple arithmetic operations using pointer technique (use new and delete operators).
3. Write a program to show the use of friend function.
4. Write a program to show the use of constructor overloading.
5. Write a program to show the use of copy constructor.
6. Write a program to show the use of destructors.
7. Write a program to show the use of virtual function.
8. Write a program to implement the concept of multilevel inheritance.
9. Write a program to implement the concept of multiple inheritance.
10. Write a program of unary operator overloading.
11. Write a program of binary operator overloading.
12. Develop an object-oriented program in C++ to read emp name, emp code, designation, experience and age; construct the database with suitable member functions using constructor, destructor and dynamic memory allocation operators new and delete.

Data Structures

Semester: 2nd Semester

Program: B.Sc.(Hons.) Artificial Intelligence & Data Science

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: C/C++ compiler / VS Code / CLion

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment objective, relevant concepts, and expected output.
- Students write/type the program or query in the designated IDE/editor listed above.
- Students compile/execute the program or run the query and observe the output.
- Errors, if any, are debugged with guidance from the lab instructor.
- Verified output is shown to the faculty/lab instructor for checking.
- Program/query and output are recorded in the lab file / record register (handwritten or printed as per department norms).

- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Program to insert and delete an element from an array.
2. Write a program to find largest and smallest elements in an array.
3. Write a program to add and subtract two matrices.
4. Write a program to multiply and transpose two matrices.
5. Program to apply various operations on stack.
6. Program for parenthesis matching using stack.
7. Program for string reversal using stack.
8. Program to insert and delete nodes in a queue.
9. Program to insert and delete nodes in a linked list.
10. Program to search a node in a linked list.
11. Program to insert or delete node in a binary tree.
12. Program to traverse binary tree.
13. Write a program using ADT to perform linear search.
14. Write a program using ADT to perform binary search.
15. Write a program in C++ to implement Bubble sort and Selection sort.
16. Write a program in C++ to implement Quick sort.
17. Program for implementing Insertion sort.
18. Program for implementing Merge sort.

Semester 3

Problem Solving and Programming in Python

Semester: 3rd Semester

Program: B.Sc.(Hons.) Artificial Intelligence & Data Science

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: Python 3.x / VS Code / Jupyter / Spyder

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment objective, relevant concepts, and expected output.
- Students write/type the program or query in the designated IDE/editor listed above.
- Students compile/execute the program or run the query and observe the output.
- Errors, if any, are debugged with guidance from the lab instructor.
- Verified output is shown to the faculty/lab instructor for checking.
- Program/query and output are recorded in the lab file / record register (handwritten or printed as per department norms).
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Write a program to perform arithmetic operations.
2. Write a program to display various types and their values.
3. Write a program to display string operations.
4. Write a program to find area of rectangle.
5. Write a program to find cube.
6. Write a program to compare two numbers as greater, smaller and equal.
7. Write a program to find greater of three numbers.
8. Write a program to find grade of a student.
9. Write a program to implement for loop.
10. Write a program to print the even numbers up to a given range.
11. Write a program to find sum of first n numbers.
12. Write a program to find factorial of first n numbers.
13. Write a program to display the pyramid.
14. Write a program to display matrix addition.
15. Write a program to display matrix multiplication.
16. Write a program to create a list of 10 numbers, multiply each element by 2, and display the list.
17. Write a program to create a dictionary and display it.
18. Write a program to add, delete and iterate the dictionary.
19. Write a program to find the cube of a number using function.
20. Write a program to find area of rectangle using function.
21. Write a program to make a class.
22. Write a program to show the concept of overriding.

Fundamentals of DBMS

Semester: 3rd Semester

Program: B.Sc.(Hons.) Artificial Intelligence & Data Science

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: MySQL (via WAMP Server) / VS Code

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment objective, relevant concepts, and expected output.
- Students write/type the program or query in the designated IDE/editor listed above.
- Students compile/execute the program or run the query and observe the output.
- Errors, if any, are debugged with guidance from the lab instructor.
- Verified output is shown to the faculty/lab instructor for checking.
- Program/query and output are recorded in the lab file / record register (handwritten or printed as per department norms).
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Creating the table.
2. Querying the record using ORDER BY clause.
3. Querying the record using GROUP BY clause.
4. Querying the record using multiple conditions.
5. Create synonyms.
6. Create sequences.
7. Create views.
8. Create indexes.
9. Create triggers.

Semester 4

Web Technology

Semester: 4th Semester

Program: B.Sc.(Hons.) Artificial Intelligence & Data Science

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: HTML, CSS, JavaScript, Bootstrap / VS Code / Web Browser

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment objective, relevant concepts, and expected output.
- Students write/type the program or query in the designated IDE/editor listed above.
- Students compile/execute the program or run the query and observe the output.
- Errors, if any, are debugged with guidance from the lab instructor.
- Verified output is shown to the faculty/lab instructor for checking.
- Program/query and output are recorded in the lab file / record register (handwritten or printed as per department norms).
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Create a web page to show the structure of HTML.
2. Show the use of formatting tags in HTML.
3. Write HTML code to show the use of absolute and relative URL with anchor tag.
4. Show the use of image tag and show images as buttons.
5. Create a web page to show the use of image maps.
6. Create a table in which colspan and rowspan elements are used.
7. Create a webpage to show the use of different lists available in HTML.
8. Create a webpage to show the use of frame tag in HTML.
9. Create admission form for a college.
10. Program to add two numbers in JavaScript.
11. Program to swap two numbers.
12. Program to check if a number is even or odd.
13. Program to find factorial of a number.
14. Program to display multiplication table.

Data Analysis using Python

Semester: 4th Semester

Program: B.Sc.(Hons.) Artificial Intelligence & Data Science

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: Python 3.x, NumPy, Pandas / Jupyter Notebook

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment objective, relevant concepts, and expected output.
- Students write/type the program or query in the designated IDE/editor listed above.
- Students compile/execute the program or run the query and observe the output.
- Errors, if any, are debugged with guidance from the lab instructor.
- Verified output is shown to the faculty/lab instructor for checking.
- Program/query and output are recorded in the lab file / record register (handwritten or printed as per department norms).
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Introduction to IPython Notebooks.
2. Introduction to Jupyter Notebooks.
3. NumPy basics: arrays and vectorized computation.
4. Structures and record arrays.
5. Introduction to Pandas.
6. Arithmetic and data alignment functions.
7. Summarizing and computing descriptive statistics.
8. Data cleaning and preparation.
9. Data aggregation and group operations.
10. Quantile and bucket analysis.

Semester 5

Workshop in Linux

Semester: 5th Semester

Program: B.Sc.(Hons.) Artificial Intelligence & Data Science

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: Linux Terminal (Ubuntu/CentOS environment or VM)

Additional Requirement / Note: Requires a Linux environment (dual-boot, VM, or WSL) in addition to the standard Windows configuration listed above.

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment objective, relevant concepts, and expected output.
- Students write/type the program or query in the designated IDE/editor listed above.
- Students compile/execute the program or run the query and observe the output.
- Errors, if any, are debugged with guidance from the lab instructor.
- Verified output is shown to the faculty/lab instructor for checking.
- Program/query and output are recorded in the lab file / record register (handwritten or printed as per department norms).
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Commands: pwd, cd, mkdir, cat, more, less, head, tail, ls, date, cal, rmdir, mv, rm, cp.
2. Demonstration of chmod command.
3. How to list hidden files/directories.
4. How to skip current (.) and previous (..) directory entries in the output.
5. How to display files/directories in reverse order.
6. How to sort ls command output based on file extensions.
7. How to sort files based on modification time.
8. How to list subdirectories recursively.
9. How to list filenames along with their inode numbers.
10. How to display detailed information about files and directories.
11. How to display author information.
12. Write a shell script to check whether an entered number is negative, positive or zero.
13. Write a shell script for checking even/odd numbers using && operator.
14. Write a shell script for removing duplicate lines from files.

R Programming & Machine Learning

Semester: 5th Semester

Program: B.Sc.(Hons.) Artificial Intelligence & Data Science

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: R / RStudio

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment objective, relevant concepts, and expected output.
- Students write/type the program or query in the designated IDE/editor listed above.
- Students compile/execute the program or run the query and observe the output.
- Errors, if any, are debugged with guidance from the lab instructor.
- Verified output is shown to the faculty/lab instructor for checking.

- Program/query and output are recorded in the lab file / record register (handwritten or printed as per department norms).
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Installing R and packages in R.
2. Programs on data types in R.
3. Built-in functions in R.
4. Creating and manipulating a vector in R.
5. Creating and manipulating a matrix in R.
6. Creating and operations on factors in R.
7. Operations on data frames in R.
8. Operations on lists in R.
9. Programs on operators in R.
10. Programs on if-else statements in R.
11. Programs on loops in R.
12. Customizing and saving graphs in R.
13. PLOT function in R to customize graphs.
14. Use R for supervised learning.
15. Use R for unsupervised learning.

Semester 6

Web Development using PHP and MySQL

Semester: 6th Semester

Program: B.Sc.(Hons.) Artificial Intelligence & Data Science

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: PHP, MySQL / WAMP Server / VS Code

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment objective, relevant concepts, and expected output.
- Students write/type the program or query in the designated IDE/editor listed above.
- Students compile/execute the program or run the query and observe the output.
- Errors, if any, are debugged with guidance from the lab instructor.
- Verified output is shown to the faculty/lab instructor for checking.
- Program/query and output are recorded in the lab file / record register (handwritten or printed as per department norms).
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Write a program to print any text in PHP.
2. Write a program to print the data types of PHP i.e. String, Integer, Floating point numbers, Boolean, Array, Object, NULL.
3. Write a program of arithmetic operators.
4. Write a program using conditional statements.
5. Write a program to implement switch case in PHP.
6. Write a program to add two numbers using functions.
7. Write a program to implement while loop.
8. Print different values using for-each loop.
9. Create a date from a string with PHP strtotime() function.
10. Write a program to open, read and close a file in PHP.
11. Write a function to connect and create a database using PHP.
12. Write a program to implement the mail function.
13. Write a program to implement WHERE clause in PHP-MySQL.
14. Write a program to implement file upload using PHP.
15. Write a program to start, store and delete a session variable.

Big Data Analysis and Visualization

Semester: 6th Semester

Program: B.Sc.(Hons.) Artificial Intelligence & Data Science

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: Hadoop (single-node setup)

Additional Requirement / Note: Hadoop is not part of the standard MCA Lab-I software list; requires separate installation/configuration on lab systems or a dedicated VM prior to sessions.

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment objective, relevant concepts, and expected output.
- Students write/type the program or query in the designated IDE/editor listed above.
- Students compile/execute the program or run the query and observe the output.
- Errors, if any, are debugged with guidance from the lab instructor.

- Verified output is shown to the faculty/lab instructor for checking.
- Program/query and output are recorded in the lab file / record register (handwritten or printed as per department norms).
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Understanding Big Data tools.
2. Installation of Hadoop.
3. Configuring Hadoop.
4. Understanding Hadoop frameworks.

Standard Operating Procedures (SOPs) for Computer Science Labs

Program: Bachelor of Vocation — Software Development, B.Voc(SD)

PG Department of Computer Science, Sri Guru Teg Bahadur Khalsa College, Sri Anandpur Sahib

Lab Configuration Reference (BVoc Lab)

Hardware Model: Dell Optiplex 3020

Processing Unit: Intel Core i5, 12th Generation, 3.00 GHz

Memory Capacity: 8 GB DDR3 RAM

SSD : 256 GB

Lab Capacity: 28 active workstations

Core Languages Installed: C/C++, Java, Python, R

Web Technologies Installed: HTML, CSS, JavaScript, Bootstrap, Node.js, PHP

IDE & Tooling Installed: VS Code, CLion, Eclipse, Jupyter, Spyder, RStudio, WAMP Server

General Instructions & Lab Conduct Rules (applicable to all subjects below)

- Students must carry their identity card and lab record file/notebook to every lab session.
- Bags and personal belongings should be kept in the designated area, not on workstations.
- Food, drinks, and use of mobile phones (except for academic reference, with faculty permission) are not allowed inside the lab.
- Students must not install, download, or copy unauthorized software or files on lab systems.
- Any hardware/software malfunction must be reported immediately to the lab attendant/faculty.
- Students must save their work at regular intervals and are responsible for maintaining backups of their own work.
- Data/programs of one student must not be copied from another; plagiarism in lab records will be dealt with as per college norms.
- Electrical points, UPS, and networking equipment should not be tampered with.
- Log-in and log-out timings should be maintained in the lab attendance/usage register.
- The last user must shut down the system properly and switch off peripherals before leaving.

Semester 1

Fundamentals of Information Technology

Semester: 1st Semester

Program: Bachelor of Vocation (Software Development) — B.Voc(SD)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: MS-Word, MS-PowerPoint, MS-Excel (MS Office Suite)

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Activities

I. MS-Word

- Activity 1: Create, open, save and close a document; typing, copying, moving and deleting data; Save/Save as, Cut/Copy, Paste/Paste Special.
- Activity 2: Formatting data — text formatting (font size, style, color, subscript, superscript, case), alignment, character spacing, indentation, line spacing, borders/shading, bullets and numbering.
- Activity 3: Find and replace, data sorting, protecting the document, adding charts, page size/margin/orientation, hyphenation, columns and line numbers.
- Activity 4: Page color, page border, themes, watermarks; adding tables, headers/footers, pictures, page numbers, special symbols, text boxes; ruler, gridlines, document map, thumbnails, WordArt, drop cap, hyperlink, equation.
- Activity 5: Arranging/splitting windows, mail merge, creating and running macros, setting print properties.

II. PowerPoint

- Activity 1: Create, open, save and close a presentation; typing, copying, moving, deleting data; new slide, slide layout, adding/deleting slides.
- Activity 2: Formatting data in slides — text formatting, alignment, character spacing, indentation, line spacing, borders/shading, bullets and numbering.
- Activity 3: Slide size/margin/orientation; adding tables, headers/footers, pictures, page numbers, special symbols, text boxes.
- Activity 4: Adding animation and transition effects, slide show, presentation views, formatting commands.
- Activity 5: Creating and running macros, arranging/splitting windows.

III. MS-Excel

- Activity 1: Create, open, save, close workbook; create/rename/move worksheet; entering, copying, moving, deleting data; insert/delete cells, columns, rows.
- Activity 2: Formatting data in cells — text formatting, cell borders, alignment, text orientation, direction, control.
- Activity 3: Find and replace, data sorting and filtering, protecting worksheet/workbook, basic formulas.
- Activity 4: Basic functions, creating charts, page size/margin/orientation, print properties.
- Activity 5: Hide/unhide rows and columns, set column width/row height, add text box/headers/footers/pictures/special symbols, arranging/splitting/hiding windows, freezing panes, macros.

C Programming

Semester: 1st Semester

Program: Bachelor of Vocation (Software Development) — B.Voc(SD)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: GCC / VS Code / CLion

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Write a program to print the size of all the data types supported by C.
2. Write a program to check whether the given number is an even number or not.
3. Write a program to accept three numbers and find the largest among them.
4. Write a program to count the different vowels in a line of text using switch.
5. Write a program to accept two numbers and perform various arithmetic operations (+, -, *, /) based on the symbol entered.
6. Write a program to find factorial of a number.
7. Write a program to print all prime numbers between any 2 given limits.
8. Write a program to print all the Armstrong numbers between any 2 given limits.
9. Write a program to demonstrate the use of break and continue statements.
10. Write a program to find largest element in an array.
11. Write a program to search an element in an array.
12. Write a program to find sum and average of numbers stored in an array.
13. Write a program to check whether a string is a Palindrome.
14. Write a program to perform matrix addition.
15. Write a program to perform matrix multiplication.
16. Write a program to demonstrate string handling functions.
17. Write a function to swap two numbers using pointers.
18. Write a program to access an array of integers using pointers.
19. Write a program to demonstrate the methods of argument passing.
20. Write a program to find the roots of a quadratic equation using function.
21. Write a recursive program to find the factorial of a number.
22. Write a recursive program to find the nth Fibonacci number.
23. Write a program to show the significance of different storage classes.
24. Write a program to create an employee structure and display the same.
25. Write a program to create a student database storing the roll no, name, class etc. and sort by name.

Web Designing using HTML

Semester: 1st Semester

Program: Bachelor of Vocation (Software Development) — B.Voc(SD)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: HTML, CSS / VS Code / Web Browser

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.

- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Assignment on structure of HTML.
2. Assignment on HTML tags.
3. Assignment on HTML lists.
4. Assignment on HTML images.
5. Assignment on HTML tables.
6. Assignment on HTML links.
7. Assignment on HTML forms.
8. Assignment on HTML frames.
9. Assignment on CSS properties.

Semester 2

Object Oriented Programming Using C++ and Data Structures

Semester: 2nd Semester

Program: Bachelor of Vocation (Software Development) — B.Voc(SD)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: G++ / VS Code / CLion

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments — Object Oriented Programming (C++)

1. Write a program to find area of rectangle using the concept of classes & object.
2. Write a program to implement the concept of array of object.
3. Write a program to show the use of friend function.
4. Write a program to show the use of constructor overloading.
5. Write a program to show the use of copy constructor.
6. Write a program to show the use of destructors.
7. Write a program to show the use of virtual function.
8. Write a program to implement the concept of multilevel inheritance.
9. Write a program to implement the concept of multiple inheritance.
10. Write a program of unary operator overloading.
11. Write a program of binary operator overloading.
12. Write a program to swap two values independent of type of the variable using function template.
13. Write a program to illustrate how an exception is handled using try-catch block and throw statements.

List of Experiments — Data Structures

1. Program to insert an element from an array.
2. Program to delete an element from an array.
3. Program to store an array using sparse representation.
4. Program to apply various operations on stack.
5. Program for parenthesis matching using stack.
6. Program for string reversal using stack.
7. Program to insert and delete nodes in a queue.
8. Program to insert and delete nodes in a linked list.
9. Program to search a node in a linked list.
10. Program to insert or delete node in a binary tree.
11. Program to traverse binary tree.
12. Program for implementing linear search.
13. Program for implementing binary search.
14. Program for implementing Bubble sort.
15. Program for implementing Selection sort.

16. Program for implementing Insertion sort.
17. Program for implementing Quick sort.
18. Program for implementing Merge sort.

Semester 3

Programming Using Java

Semester: 3rd Semester

Program: Bachelor of Vocation (Software Development) — B.Voc(SD)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: JDK / Eclipse / VS Code

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. WAP to demonstrate the concept of class.
2. WAP that illustrates the use of constructor.
3. WAP for constructor overloading.
4. WAP for single inheritance using super keyword.
5. WAP for multilevel inheritance.
6. WAP to demonstrate method overriding.
7. WAP that implements multiple inheritance through interface.
8. WAP to demonstrate importing multiple packages.
9. WAP to demonstrate creating threads by extending Thread class.
10. WAP to demonstrate creating threads by implementing Runnable interface.
11. WAP that illustrates the use of exception handling.
12. WAP to implement Flow Layout.
13. WAP to implement Grid Layout.
14. Write code for event handling, database connectivity and report generation.

Fundamentals of DBMS

Semester: 3rd Semester

Program: Bachelor of Vocation (Software Development) — B.Voc(SD)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: MySQL (via WAMP Server) / VS Code

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Creating a table.
2. Specifying relational data types.
3. Specifying constraints (Primary, Foreign and Not Null).
4. DML statements.
5. TCL statements.
6. Creating a table from an existing table.
7. DROP, ALTER and RENAME statement.
8. The SELECT statement using the WHERE clause.
9. The SELECT statement using logical operators in the WHERE clause.
10. The SELECT statement using IN, BETWEEN, LIKE, ORDER BY clause and GROUP BY clause.

Workshop on Adobe Photoshop

Semester: 3rd Semester

Program: Bachelor of Vocation (Software Development) — B.Voc(SD)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: Adobe Photoshop

Additional Requirement / Note: Adobe Photoshop is not part of the standard MCA Lab-I software list; requires licensed installation prior to sessions.

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Installation of Adobe Photoshop in Windows.
2. Introduction of various tools.
3. Creating and opening a document in Adobe Photoshop.
4. Understanding different image file formats.
5. Working with multiple images and understanding rules and grids.
6. Creating multicolor images.
7. Familiarization with cropping, rotating and overlapping photos on a page.
8. Understanding layers — creating, selecting, editing, locking and grouping layers.
9. Understanding layer styles, layer mask and consolidating layers.
10. Photoshop filters.
11. Familiarization with various effects of filters.

Semester 4

Web Development using PHP and MySQL and Content Management System

Semester: 4th Semester

Program: Bachelor of Vocation (Software Development) — B.Voc(SD)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: PHP, MySQL / WAMP Server / VS Code

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Write a program to print any text in PHP.
2. Write a program to print the data types of PHP i.e. String, Integer, Floating point numbers, Boolean, Array, Object, NULL.
3. Write a program of arithmetic operators.
4. Write a program using conditional statements.
5. Write a program to implement switch case in PHP.
6. Write a program to add two numbers using functions.
7. Write a program to implement while loop.
8. Print different values using for-each loop.
9. Create a date from a string with PHP strtotime() function.
10. Write a program to open, read and close a file in PHP.
11. Write a function to connect and create a database using PHP.
12. Write a program to implement the mail function.
13. Write a program to implement WHERE clause in PHP-MySQL.
14. Write a program to implement file upload using PHP.
15. Write a program to start, store and delete a session variable.

Relational Database Management System

Semester: 4th Semester

Program: Bachelor of Vocation (Software Development) — B.Voc(SD)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: MySQL (via WAMP Server) / VS Code

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.

- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Creating the table.
2. Querying the record using ORDER BY clause.
3. Querying the record using GROUP BY clause.
4. Querying the record using multiple conditions.
5. Create synonyms.
6. Create sequences.
7. Create views.
8. Create indexes.
9. Create triggers.
10. Create cursors for procedures.

Semester 5

Programming using Python

Semester: 5th Semester

Program: Bachelor of Vocation (Software Development) — B.Voc(SD)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: Python 3.x / VS Code / Jupyter / Spyder

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Write a program to perform arithmetic operations.
2. Write a program to display various types and their values.
3. Write a program to display string operations.
4. Write a program to find area of rectangle.
5. Write a program to find cube.
6. Write a program to compare two numbers as greater, smaller and equal.
7. Write a program to find greater of three numbers.
8. Write a program to find grade of a student.
9. Write a program to implement for loop.
10. Write a program to print the even numbers up to a given range.
11. Write a program to find sum of first n numbers.
12. Write a program to find factorial of first n numbers.
13. Write a program to display the pyramid.
14. Write a program to display matrix addition.
15. Write a program to display matrix multiplication.
16. Write a program to create a list of 10 numbers, multiply each element by 2, and display the list.
17. Write a program to create a dictionary and display it.
18. Write a program to add, delete and iterate the dictionary.
19. Write a program to find the cube of a number using function.
20. Write a program to find area of rectangle using function.
21. Write a program to make a class.
22. Write a program to show the concept of overriding.

Web Development using ASP.NET

Semester: 5th Semester

Program: Bachelor of Vocation (Software Development) — B.Voc(SD)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: Visual Studio, ASP.NET, SQL Server

Additional Requirement / Note: Visual Studio / ASP.NET / SQL Server are not part of the standard MCA Lab-I software list; requires separate installation prior to sessions.

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
- Students compile/execute the program, run the query, or complete the activity and observe the output/result.
- Errors, if any, are debugged / corrected with guidance from the lab instructor.
- Verified output/result is shown to the faculty/lab instructor for checking.
- Program/query/activity output is recorded in the lab file / record register as per department norms.
- Workstation is shut down properly and the seat is left clean before leaving the lab.

List of Experiments

1. Write a program to show the use of standard controls in a web form.
2. Write a program containing the list controls and its functions.
3. Write a program to show the use of file upload and calendar control.
4. Write a program to display advertisement on a web page.
5. Write a program to create an admission form for a college.
6. Write a program to demonstrate the master page.
7. Write a program to create a login page which accepts user name and password, then check for authentication of the user.
8. Write a program that demonstrates a textbox for user input name and validates it using Required Field Validation.
9. Create a user control that displays the current date and time; include it in a Web Form and refresh it each time a button is clicked.
10. Create a user control that receives the user name and password and validates them (authorized if username is "Radiant" and password is "asp.net", otherwise not).
11. Write a program to demonstrate ADO.NET controls.
12. Write a program to demonstrate submitting data to a database using ADO.NET controls.

Workshop on Corel Draw

Semester: 5th Semester

Program: Bachelor of Vocation (Software Development) — B.Voc(SD)

Lab: MCA Lab-I, PG Department of Computer Science

Software / Tools Required: CorelDRAW

Additional Requirement / Note: CorelDRAW is not part of the standard MCA Lab-I software list; requires licensed installation prior to sessions.

Procedure for Conducting the Lab Session

- Students log in to the allotted workstation using their credentials and verify system and software availability.
- Faculty briefs students on the experiment/activity objective, relevant concepts, and expected output.
- Students write/perform the program, query, or activity in the designated software/IDE listed above.
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List of Experiments

1. Exploring the user interface of CorelDRAW.
2. Working with tools of CorelDRAW.
3. Working with text and lines.

4. Working with different shapes.
5. Working with curves.
6. Working with colors.
7. Working with tables.