DEPARTMENT OF COMPUTER SCIENCE

Syllabus Structure under

Choice Based Credit System

for

B.Sc. (Hons.) Computer Science

Session 2018-2021

RAMAKRISHNA MISSION VIVEKANANDA CENTENARY COLLEGE

Rahara, Kolkata-118

The course of B.Sc. Computer Science syllabus is introduced under CBCS vide BOS resolution dated 22nd May 2018 with 100% change.

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Semester-wise Distribution of Course and Credits

Course Code	Title	Credits
Semester – I		
UGCMSAECC01	English/MIL communications/Environmental Science	2
UGCMSCC01	Programming Fundamentals using C/C++: Theory & Lab	4+2
UGCMSCC02	Computer System Architecture: Theory & Lab	4+2
GE 1	Physics: Theory & Tutorial	5+1
Semester – II		
UGCMSAECC02	English/MIL communications/Environmental Science	2
UGCMSCC03	Programming in JAVA: Theory & Lab	4+2
UGCMSCC04	Discrete Structures: Theory & Tutorial	6
GE 2	Physics: Theory & Tutorial	5+1
Semester – III		
UGCMSCC05	Data Structures: Theory & Lab	4+2
UGCMSCC06	Operating Systems: Theory & Lab	4+2
UGCMSCC07	Computer Networks: Theory & Lab	4+2
UGCMSSEC01	Value Education	2
UGCMSGE03	Mathematics: Theory & Tutorial	5+1
Semester – IV		
UGCMSCC08	Design and Analysis of Algorithms: Theory & Lab	4+2
UGCMSCC09	Software Engineering: Theory & Lab	4+2
UGCMSCC10	Database Management Systems: Theory & Lab	4+2
UGCMSSEC02	Programming in Python	2
GE 4	Mathematics: Theory & Tutorial	5+1
Semester – V		
UGCMSCC11	Internet Technologies: Theory & Lab	4+2
UGCMSCC12	Theory of Computation: Theory & Tutorial	6
	Select any **Two** of the following:	
UGCMSDSE01	Microprocessor: Theory & Lab	4+2
UGCMSDSE02	Numerical Methods: Theory & Lab	4+2
UGCMSDSE03	Cloud Computing: Theory & Lab	4+2
Semester – VI		
UGCMSCC13	Artificial Intelligence: Theory & Lab	4+2
UGCMSCC14	Computer Graphics: Theory & Lab	4+2

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Course Code	Title	Credits
	Select any **Two** of the following:	
UGCMSDSE04	Machine Learning: Theory & Lab	4+2
UGCMSDSE05	Data Mining: Theory & Lab	4+2
UGCMSDSE06	Dissertation or Project work	6

Course Code	Title	Credits
	Generic Elective Papers (For Other Departments)	
UGCMSGE01	Computer Fundamentals & Lab	4+2
UGCMSGE02	Introduction to Database System	4+2
UGCMSGE03	Programming Fundamentals using C/C++	4+2
UGCMSGE04	Programming in Python	4+2

* AECC: Ability Enhancement Compulsory Course, CC: Core Course, SEC: Skill Enhancement Course, DSE: Discipline Specific Elective, GE: Generic Elective

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Programme Outcome:

After completion of the B.Sc. Degree program, the students will be able to:

PO No.	Programme Outcomes	Cognitive Level
PO 1	Recognize the scientific tempers and attitudes, which in turn can prove to be beneficial for the society since the scientific developments can make a nation or society to grow at a rapid pace.	R
PO 2	Understand scientific knowledge and exchange ideas with other stakeholders; make people aware about sustainable utilization of resources with ethical approach.	U
PO 3	Understand and apply the issues of environmental contexts and sustainable development as a basic interdisciplinary concern.	U, Ap
PO 4	Create the ability to perform experiments and to analyse & interpret the obtained accurate results and thus gain the ability to solve problems, to involve in critical, independent, and creative thinking.	An, E, C
PO 5	Possess expertise to apply and formulate ideas which will provide them competitive advantage in pursuing higher studies from India or abroad; and seek jobs in academia, research or industries.	Ap, E
PO 6	Assemble the acquired in-depth knowledge of applied subjects towards the inculcation of professional and employment skills so that students can make a career and become an entrepreneur in diverse fields.	C

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating

Programme Specific Outcomes:

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

PSO No.	Programme Specific Outcomes	Cognitive Level
PSO1	The ability to define and illustrate the concepts of algorithms, data structures/management, software design, concepts of programming languages and computer organization & architecture.	R(1), U(2)
PSO2	Demonstrate the capability to work with and communicate effectively with professionals in various fields and pursue lifelong professional development in computing.	U(2), Ap(3)
PSO3	Use the learned concepts to analyse problems in computational domain and design viable prototypes.	Ap(3), An(4), C(6)
PSO4	Ability to analyse and explain standard software engineering principles to develop efficient solutions for emerging software related challenges in the computation domain.	An(4), E(5), C(6)
PSO5	Develop their skills to solve problems in the broad area of programming concepts and appraise environmental and social issues with ethics and manage different projects in inter-disciplinary field.	E(5), C(6)
PSO6	Ability to interpret, design, develop, implement computer programs and use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations.	E(5), C(6)

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Semester-wise detailed syllabus

Core Courses: Credit: 6 each

SEMESTER-I
Name of the course: **Programming Fundamentals using C/C++** → 100% modification
Course code: **UGCMSCC01**
Total Class Hours: **120** Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. Knowledge and capability to find computational solution of different problems.
2. Capability to construct algorithm of problems.
3. Understanding the C/C++ programming language.
4. Knowledge of basic programming aspects such as loop, function, array, structure, class, objects, etc.

SYLLABUS

A Theory (60 Hours) **4 Credits**

1. **Introduction to C and C++** (3 L)

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

2. **Data Types, Variables, Constants, Operators and Basic I/O** (5 L)

   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, putchar etc), Formatted and Console I/O (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h, conio.h etc).

3. **Expressions, Conditional Statements and Iterative Statements** (5 L)

   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)

4. **Functions and Arrays** (10 L)

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

5. **Derived Data Types (Structures and Unions)** (3 L)

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.

6. **Pointers and References in C++** (7 L)

Understanding a Pointer Variable, Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Pointers to structures, Problems with Pointers, Passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions. Pointers vs. References, Declaring and initializing references, Using references as function arguments and function return values

7. **Memory Allocation in C++** (3 L)

Differentiating between static and dynamic memory allocation, use of malloc, calloc and free functions, use of new and delete operators, storage of variables in static and dynamic memory allocation

8. **File I/O, Preprocessor Directives** (4 L)

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

9. **Using Classes in C++** (7 L)

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.

10. **Overview of Function Overloading and Operator Overloading** (5 L)

    Need of Overloading functions and operators, Overloading functions by number and type of arguments, Looking at an operator as a function call, Overloading Operators (including assignment operators, unary operators)

11. **Inheritance, Polymorphism and Exception Handling** (8 L)

    Introduction to Inheritance (Multi-Level Inheritance, Multiple Inheritance), Polymorphism (Virtual Functions, Pure Virtual Functions), Basics Exceptional Handling (using catch and throw, multiple catch statements), Catching all exceptions, Restricting exceptions, Rethrowing exceptions.

B Practical (60 Hours) **2 Credits**

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 print a triangle of stars as follows (take number of lines from user):

```
*
***
*****
*******
*********
```

10. WAP to perform following actions on an array entered by the user:
    a) Print the even-valued elements
    b) Print the odd-valued elements
    c) Calculate and print the sum and average of the elements of array

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d) Print the maximum and minimum element of array

e) Remove the duplicates from the array

f) 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.

11. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
12. Write a program that swaps two numbers using pointers.
13. Write a program in which a function is passed address of two variables and then alter its contents.
14. 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.
15. 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.
16. Write a menu driven program to perform following operations on strings:
    a) Show address of each character in string
    b) Concatenate two strings without using strcat function.
    c) Concatenate two strings using strcat function.
    d) Compare two strings
    e) Calculate length of the string (use pointers)
    f) Convert all lowercase characters to uppercase
    g) Convert all uppercase characters to lowercase
    h) Calculate number of vowels
    i) Reverse the string
17. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.
18. WAP to display Fibonacci series (i)using recursion, (ii) using iteration
19. WAP to calculate Factorial of a number (i)using recursion, (ii) using iteration
20. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.
21. Create Matrix class using templates. Write a menu-driven program to perform following Matrix operations (2-D array implementation):

    a) Sum b) Difference c) Product d) Transpose
22. 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).

23. Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.
24. Create a class Box containing length, breath and height. Include following methods in it:
    a) Calculate surface Area
    b) Calculate Volume
    c) Increment, Overload ++ operator (both prefix & postfix)
    d) Decrement, Overload -- operator (both prefix & postfix)
    e) Overload operator == (to check equality of two boxes), as a friend function
    f) Overload Assignment operator
    g) 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.
25. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
26. Write a program to retrieve the student information from file created in previous question and print it in following format:

    Roll No. Name Marks
27. Copy the contents of one text file to another file, after removing all whitespaces.
28. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void.
29. 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.

Course Outcomes

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Discuss, memorize and understand the different concept of C/C++ programming constructs and classes for code reuse.	R(1), U(2)	PO2	PSO1
CO2	Solve problems and propose algorithms, pseudo codes and flowcharts for it.	Ap(3)	PO4	PSO3 PSO4

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CO3	Identify real life problems and convert it to computational problems.	Ap(3)	PO3	PSO2 PSO3
CO4	Apply the concepts of structural and object oriented programming such as loops, functions, structure, class, inheritance, friend functions, and virtual functions to develop programs for problem solving.	Ap(3), C(6)	PO3	PSO3
CO5	Analyse and Compare approaches to model efficient and standard programs.	An(4)	PO4 PO5	PSO4
CO6	Evaluate, design, compile, run and debug programs for software development.	E(5)	PO4 PO5	PSO5 PSO6

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Reference Books

1. HerbtzSchildt, "C++: The Complete Reference", Fourth Edition, McGraw Hill.2003
2. BjarneStroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley, 2013.
3. BjarneStroustroup, "Programming -- Principles and Practice using C++", 2nd Edition, Addison-Wesley 2014.
4. E Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill Education, 2008.
5. Paul Deitel, Harvey Deitel, "C++ How to Program", 8th Edition, Prentice Hall, 2011.
6. John R. Hubbard, "Programming with C++", Schaum's Series, 2nd Edition, 2000.
7. Andrew Koeni, Barbara, E. Moo, "Accelerated C++", Published by Addison-Wesley, 2000.
8. Scott Meyers, "Effective C++", 3rd Edition, Published by Addison-Wesley, 2005.
9. Harry, H. Chaudhary, "Head First C++ Programming: The Definitive Beginner's Guide", First Create space Inc, O-D Publishing, LLC USA.2014
10. Walter Savitch, "Problem Solving with C++", Pearson Education, 2007.
11. Stanley B. Lippman, JoseeLajoie, Barbara E. Moo, "C++ Primer", Published by Addison-Wesley, 5th Edition, 2012

SEMESTER-I
Name of the course: **Computer System Architecture** ~100% modification
Course code: **UGCMSCC02**
Total Class Hours: **120** Credit: **4+2 (Theory & Lab)**

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Course Objectives:

1. Knowledge of basic architectural organization and design of computer.
2. Capability to understand the concept of arithmetic and logic unit, pipelining with hierarchical memory system including cache memories and virtual memory.

SYLLABUS

A Theory (60 Hours) **4 Credits**

1. **Introduction** (8 L)

   Logic gates, Boolean algebra, combinational circuits, circuit simplification, flip-flops and sequential circuits, decoders, multiplexers, registers, counters and memory units.

2. **Data Representation and Basic Computer Arithmetic** (10 L)

   Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison, multiplication and division algorithms for integers

3. **Basic Computer Organization and Design** (13 L)

   Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input -output and interrupt, Interconnection Structures, Bus Interconnection design of basic computer.

4. **Central Processing Unit** (15 L)

   Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming, RISC, CISC architectures, pipelining and parallel architecture.

5. **Memory Organization** (6 L)

   Cache memory, Associative memory, mapping.

6. **Input-Output Organization** (8 L)

   Input / Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.

B Practical — 2 Credits

1. Create a machine based on the following architecture:

Register Set

IR		DR		AC		A R		P C		FGI		FGO		S		I		E
0 15		0 15		0 15		011		011		1 Bit		1 Bit		1 Bit		1 Bit		1 Bit

Memory 4096 words 16 bits per word	Instruction Format		
	0 3	4 15	
	Opcode	Address	

Memory Reference			Register Reference		Input-Output	
Symbol	Hex		Symbol	Hex	Symbol	Hex
AND	0xxx		CLA	E800	INP	F80 0
ADD	2xxx		CLE	E400	OUT	F40 0
LDA	4xxx		CMA	E200	SKI	F20 0
STA	6xxx		CME	E100	SKO	F10 0
BUN	8xxx		CIR	E080	ION	F08 0
BSA	Axxx		CIL	E040	IOF	F04 0
ISZ	Cxxx	Direct Addressing	INC	E020		Optional
AND_I	1xxx		SPA	E010		
ADD_I	3xxx		SNA	E008		
LDA_I	5xxx		SZA	E004		
STA_I	7xxx		SZE	E002		
BUN_I	9xxx		HLT	E001		
BSA_I	Bxxx	Indirect Addressing				
ISZ_I	Dxxx					

Refer to Chapter-5 of Morris Mano for description of instructions

2. Create the micro operations and associate with instructions as given in the chapter (except interrupts). Design the register set, memory and the instruction set. Use this

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machine for the assignments of this section.

3. Create a Fetch routine of the instruction cycle.
4. Simulate the machine to determine the contents of AC, E, PC, AR and IR registers in hexadecimal after the execution of each of following register reference instructions:

a. CLA	e. CIR	i. SNA
b. CLE	f. CIL	j. SZA
c. CMA	g. INC	k. SZE
d. CME	h. SPA	l. HLT

Initialize the contents of AC to (A937)16, that of PC to (022)16 and E to 1.

5. Simulate the machine for the following memory-reference instructions with I= 0 and address part = 082. The instruction to be stored at address 022 in RAM. Initialize the memory word at address 082 with the operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.
   a. ADD
   b. AND
   c. LDA
   d. STA
   e. BUN
   f. BSA
   g. ISZ
6. Simulate the machine for the memory-reference instructions referred in above question with I= 1 and address part = 082. The instruction to be stored at address 026 in RAM. Initialize the memory word at address 082 with the value 298. Initialize the memory word at address 298 with operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.
7. Modify the machine created in Practical 1 according to the following instruction format:

Instruction format

   a. The instruction format contains a 3-bit opcode, a 1-bit addressing mode and a 12- bit address. There are only two addressing modes, I = 0 (direct addressing)

and I = 1 (indirect addressing).

b. Create a new register I of 1 bit.

c. Create two new microinstructions as follows:

i. Check the opcode of instruction to determine type of instruction (Memory Reference/Register Reference/Input-Output) and then jump accordingly.

ii. Check the I bit to determine the addressing mode and then jump accordingly.

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Ability to define the basic architectural organization and design of computer.	R(1)	PO1	PSO1
CO2	Ability to understand the basic structure, operation and characteristics of digital computer.	U(2)	PO2	PSO1 PSO2
CO3	Ability to understand the arithmetic and logic unit as well as the concept of pipelining with hierarchical memory system including cache memories and virtual memory.	U(2)	PO2 PO3	PSO1 PSO2
CO4	Distinguish between different ways of communicating with I/O devices and standard I/O interfaces	An(4)	PO5	PSO4 PSO6

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Recommended Books:

1. M. Mano, Computer System Architecture, Pearson Education 1992
2. A. J. Dos Reis, Assembly Language and Computer Architecture using C++ and JAVA, Course Technology, 2004th
3. W. Stallings, Computer Organization and Architecture Designing for Performance, 8th Edition, Prentice Hall of India,2009
4. M.M. Mano, Digital Design, Pearson Education Asia,2013
5. Carl Hamacher, Computer Organization, Fifth edition, McGraw Hill, 2012.

SEMESTER-II
Name of the course: **Programming in Java** — 100% modification
Course code: **UGCMSCC03**
Total Class Hours: **120** Credit: **4+2 (Theory & Lab)**

Course Objectives:

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1. Knowledge of different concept of Java programming such as classes, code reusability, loops, functions, inheritance, package, interface, multithreading, etc.
2. Capability to design and reuse codes with the aid of object oriented programming.
3. Capability to develop real life problem solving applications.

SYLLABUS

A Theory (60 Hours) **4 Credits**

1. **Introduction to Java** (4 L)

   Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods)

2. **Arrays, Strings and I/O** (8 L)

   Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files.

3. **Object-Oriented Programming Overview** (4 L)

   Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.

4. **Inheritance, Interfaces, Packages, Enumerations, Autoboxing and Metadata** (14 L)

   Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing /Unboxing, Enumerations and Metadata.

5. **Exception Handling, Threading, Networking and Database Connectivity** (15 L)

   Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication,

suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

6. **Applets and Event Handling** (15 L)

Java Applets: Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, text fields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.

B Practical **2 Credits**

1. To find the sum of any number of integers entered as command line arguments
2. To find the factorial of a given number
3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of length in case of a two dimensional array
5. To convert a decimal to binary number
6. To check if a number is prime or not, by taking the number as input from the keyboard
7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument
8. Write a program that show working of different functions of String and StringBuffer classes like setCharAt(), setLength(), append(), insert(), concat() and equals().
9. Write a program to create a —distancel class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer
10. Modify the —distancel class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
11. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions (from lower to higher data type)
12. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword
13. Write a program to show the use of static functions and to pass variable length arguments in

a function.

14. Write a program to demonstrate the concept of boxing and unboxing.
15. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
16. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate fibonacii series is given in a different file belonging to the same package.
17. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages
18. Write a program —DivideByZero that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
19. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
20. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).
21. Write a program to demonstrate priorities among multiple threads.
22. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).
23. Write a program that creates a Banner and then creates a thread to scrolls the message in the banner from left to right across the applet's window.
24. Write a program to get the URL/location of code (i.e. java code) and document (i.e. html file).
25. Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed, mouseReleased() and mouseDragged().
26. Write a program to demonstrate different keyboard handling events.
27. Write a program to demonstrate the use of push buttons.

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Discuss, memorize and understand the different concept of Java programming constructs and classes for code reuse.	R(1), U(2)	PO2	PSO1

CO2	Identify real life problems and convert it to computational problems.	Ap(3)	PO6	PSO5 PSO6
CO3	Analyse the concepts of object oriented programming such as loops, functions, class, inheritance, packages, multi-threading and abstract class to develop programs for problem solving.	Ap(3), An(4)	PO3	PSO2 PSO3
CO4	Analyse and Compare approaches to model efficient and standard programs for real life application development.	An(4), E(5)	PO3	PSO3
CO5	Evaluate, design, compile, run and debug programs for software development.	E(5), C(6)	PO4 PO5	PSO4

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating

Reference Books

1. Ken Arnold, James Gosling, David Homes, "The Java Programming Language", 4th Edition, 2005.
2. James Gosling, Bill Joy, Guy L Steele Jr, GiladBracha, Alex Buckley"The Java Language Specification, Java SE 8 Edition (Java Series)", Published by Addison Wesley, 2014.
3. Joshua Bloch, "Effective Java" 2nd Edition,Publisher: Addison-Wesley, 2008.
4. Cay S. Horstmann, GaryCornell, "Core Java 2 Volume 1 ,9th Edition, Prentice Hall.2012
5. Cay S. Horstmann, Gary Cornell, "Core Java 2 Volume 2 - Advanced Features)", 9th Edition, Prentice Hall.2013
6. Bruce Eckel, "Thinking in Java", 3rd Edition, PHI, 2002.
7. E. Balaguruswamy, "Programming with Java", 4th Edition, McGraw Hill.2009.
8. Paul Deitel, Harvey Deitel, "Java: How to Program", 10th Edition, Prentice Hall, 2011.
9. "Head First Java", Orielly Media Inc. 2nd Edition, 2005.
10. David J. Eck, "Introduction to Programming Using Java", Published by CreateSpace Independent Publishing Platform, 2009.
11. John R. Hubbard, "Programming with JAVA", Schaum's Series, 2nd Edition, 2004.

SEMESTER- II
Name of the course: **Discrete Structures Theory** — 100% modification
Course code: **UGCMSCC04**
Total Class Hours: **90** Credit: **6 (Theory)**

Course Objectives:

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1. Knowledge of the notion of mathematical thinking, mathematical proofs, and algorithmic thinking, graphs and related discrete structures.
2. Capability to apply the knowledge for computational problem solving of real life problem.

SYLLABUS

Theory (90 Hours) **6 Credits**

1. **Introduction:** (25 L)

   Sets - finite and Infinite sets, uncountably Infinite Sets; functions, relations, Properties of Binary Relations, Closure, Partial Ordering Relations; counting - Pigeonhole Principle, Permutation and Combination; Mathematical Induction, Principle of Inclusion and Exclusion.

2. **Growth of Functions:** (10 L)

   Asymptotic Notations, Summation formulas and properties, Bounding Summations, approximation by Integrals

3. **Recurrences:** (20 L)

   Recurrence Relations, generating functions, Linear Recurrence Relations with constant coefficients and their solution, Substitution Method, Recurrence Trees, Master Theorem

4. **Graph Theory** (25 L)

   Basic Terminology, Models and Types, multigraphs and weighted graphs, Graph Representation, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Trees, Basic Terminology and properties of Trees, Introduction to Spanning Trees

5. **Propositional Logic** (10 L)

   Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Ability to define and understand the notion of mathematical thinking, mathematical proofs, and algorithmic thinking.	R(1), U(2)	PO1 PO2	PSO1 PSO2
CO2	Understand some basic properties of graphs and related discrete structures, and be able to relate these to practical examples.	R(1), U(2)	PO2	PSO1 PSO2
CO3	Understand the basics of combinatorics, and be able to apply the methods from these subjects in problem solving	U(2), Ap(3)	PO2	PSO2 PSO3

CO4	Understand asymptotic notation, its significance, and be able to use it to analyse asymptotic performance for some basic algorithmic examples	U(2), An(4)	PO4	PSO3 PSO4
CO5	Ability to determine effective algebraic techniques to analyse basic discrete structures and algorithms and be able to apply them in problem solving.	An(4), E(5), C(6)	PO4	PSO4 PSO6

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating

Reference Books

1. C.L. Liu, D.P. Mahopatra, Elements of Discrete mathematics, 2nd Edition, Tata McGraw Hill, 1985,
2. Kenneth Rosen, Discrete Mathematics and Its Applications, 6th Edition, McGraw Hill 2006
3. T.H. Coremen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, 3rd edition Prentice Hall on India, 2009
4. M. O. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms, John wiley Publication, 1988
5. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Edition, Jones and Bartlett Publishers, 2009
6. D.J. Hunter, Essentials of Discrete Mathematics, Jones and Bartlett Publishers, 2008

SEMESTER- III	
Name of the course: **Data Structures** — 100% modification	
Course code: **UGCMSCC05**	
Total Class Hours: **120**	Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. Knowledge of fundamental data structures like: array, linked list, stack, queue, tree , graph, etc.
2. Capability to apply the knowledge for choosing a data structure to suitably model any data used in computer applications.

SYLLABUS

A Theory (60 Hours) **4 Credits**

1. **Arrays** (5 L)

   Single and Multi-dimensional Arrays, Sparse Matrices (Array and Linked Representation)

2. **Stacks** (5 L)

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Implementing single / multiple stack/s in an Array; Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Applications of stack; Limitations of Array representation of stack

3. **Linked Lists** (10 L)

   Singly, Doubly and Circular Lists (Array and Linked representation); Normal and Circular representation of Stack in Lists; Self Organizing Lists; Skip Lists

4. **Queues** (5 L)

   Array and Linked representation of Queue, De-queue, Priority Queues

5. **Recursion** (5 L)

   Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion; Understanding what goes behind Recursion (Internal Stack Implementation)

6. **Trees** (20 L)

   Introduction to Tree as a data structure; Binary Trees (Insertion, Deletion , Recursive and Iterative Traversals on Binary Search Trees); Threaded Binary Trees (Insertion, Deletion, Traversals); Height-Balanced Trees (Various operations on AVL Trees).

7. **Searching and Sorting** (5 L)

   Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Insertion Sort, Shell Sort, Comparison of Sorting Techniques.

8. **Hashing** (5 L)

   Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collusion by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing Function

B Practical (60 Hours) **2 Credits**

1. Write a program to search an element from a list. Give user the option to perform Linear or Binary search. Use Template functions.
2. WAP using templates to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.
3. Implement Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list and concatenate two linked lists (include a function and also overload operator +).

4. Implement Doubly Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
5. Implement Circular Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
6. Perform Stack operations using Linked List implementation.
7. Perform Stack operations using Array implementation. Use Templates.
8. Perform Queues operations using Circular Array implementation. Use Templates.
9. Create and perform different operations on Double-ended Queues using Linked List implementation.
10. WAP to scan a polynomial using linked list and add two polynomials.
11. WAP to calculate factorial and to compute the factors of a given no. (i)using recursion, (ii)using iteration
12. WAP to display Fibonacci series (i)using recursion, (ii) using iteration
13. WAP to calculate GCD of 2 number (i) with recursion (ii) without recursion
14. WAP to create a Binary Search Tree and include following operations in tree:
    a) Insertion (Recursive and Iterative Implementation)
    b) Deletion by copying
    c) Deletion by Merging
    d) Search a no. in BST
    e) Display its preorder, postorder and inorder traversals Recursively
    f) Display its preorder, postorder and inorder traversals Iteratively
    g) Display its level-by-level traversals
    h) Count the non-leaf nodes and leaf nodes
    i) Display height of tree
    j) Create a mirror image of tree
    k) Check whether two BSTs are equal or not
15. WAP to convert the Sparse Matrix into non-zero form and vice-versa.
16. WAP to reverse the order of the elements in the stack using additional stack.
17. WAP to reverse the order of the elements in the stack using additional Queue.
18. WAP to implement Diagonal Matrix using one-dimensional array.
19. WAP to implement Lower Triangular Matrix using one-dimensional array.
20. WAP to implement Upper Triangular Matrix using one-dimensional array.

21. WAP to implement Symmetric Matrix using one-dimensional array.
22. WAP to create a Threaded Binary Tree as per inorder traversal, and implement operations like finding the successor / predecessor of an element, insert an element, inorder traversal.
23. WAP to implement various operations on AVL Tree.

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Ability to define fundamental data structures and with the manner in which these data structures can best be implemented.	R(1)	PO1	PSO1 PSO2
CO2	Ability to understand the complexity of basic operations like insert, delete, search on these data structures.	U(2)	PO2 PO3	PSO1 PSO2
CO3	Ability to analyse and know the applications of algorithms for sorting, pattern matching etc	An(4)	PO4	PSO3 PSO4
CO4	Ability to choose a data structure to suitably model any data used in computer applications.	E(5)	PO4	PSO4
CO5	Ability to assess efficiency trade-offs among different data structure implementations.	E(5)	PO5	PSO4 PSO5
CO6	Design programs using various data structures including hash tables, Binary and general search trees, heaps, graphs etc.	C(6)	PO6	PSO6

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating

Reference Books

1. Adam Drozdek, "Data Structures and algorithm in C++", 3rd Edition, Cengage Learning, 2012.
2. SartajSahni, Data Structures, "Algorithms and applications in C++", 2nd Edition, Universities Press, 2011.
3. Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, "Data Structures Using C and C++, 2nd edition, PHI, 2009.
4. Robert L. Kruse, "Data Structures and Program Design in C++", Pearson,1999.
5. D.S Malik, Data Structure using C++, 2nd edition, Cengage Learning, 2010.
6. Mark Allen Weiss, "Data Structures and Algorithms Analysis in Java", Pearson Education, 3rd edition, 2011
7. Aaron M. Tenenbaum, Moshe J. Augenstein, Yedidyah Langsam, "Data Structures Using Java, 2003.
8. Robert Lafore, "Data Structures and Algorithms in Java, 2/E", Pearson/ Macmillan Computer Pub,2003

9. John Hubbard, "Data Structures with JAVA", McGraw Hill Education (India) Private Limited; 2nd edition, 2009
10. Goodrich, M. and Tamassia, R. "Data Structures and Algorithms Analysis in Java", 4th Edition, Wiley,2013
11. Herbert Schildt, "Java The Complete Reference (English) 9th Edition Paperback", Tata McGraw Hill, 2014.
12. D. S. Malik, P.S. Nair, "Data Structures Using Java", Course Technology, 2003.

SEMESTER- III	
Name of the course: **Operating Systems** → 100% modification	
Course code: **UGCMSCC06**	
Total Class Hours: **120**	Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. Knowledge of the role of operating system in their management policies and algorithms.
2. Knowledge of the design issues, various process management concepts, scheduling, synchronization, and deadlocks associated with operating systems
3. Capability to identify potential threats to operating systems and will have the ability to understand the security features to guard against them.

SYLLABUS

A Theory (60 Hours) **4 Credits**

1. **Introduction** (10 L)

   Basic OS functions, resource abstraction, types of operating systems–multiprogramming systems, batch systems, time sharing systems; operating systems for personal computers & workstations, process control & real time systems.

2. **Operating System Organization** (6 L)

   Processor and user modes, kernels, system calls and system programs.

3. **Process Management** (20 L)

   System view of the process and resources, process abstraction, process hierarchy, threads, threading issues, thread libraries; Process Scheduling, non-pre-emptive and pre-emptive

scheduling algorithms; concurrent and processes, critical section, semaphores, methods for inter-process communication; deadlocks.

4. **Memory Management** (10 L)

   Physical and virtual address space; memory allocation strategies –fixed and variable partitions, paging, segmentation, virtual memory

5. **File and I/O Management** (10 L)

   Directory structures, file operations, file allocation methods, device management.

6. **Protection and Security** (4 L)

   Policy mechanism, Authentication, Internal access Authorization.

B Practical (60 Hours) **2 Credits**

C/ C++ programs

1. WRITE A PROGRAM (using fork() and/or exec() commands) where parent and child execute: same program, same code, same program, different code, before terminating, the parent waits for the child to finish its task.
2. WRITE A PROGRAM to report behaviour of Linux kernel including kernel version, CPU type and model. (CPU information)
3. WRITE A PROGRAM to report behaviour of Linux kernel including information on configured memory, amount of free and used memory. (memory information)
4. WRITE A PROGRAM to print file details including owner access permissions, file access time, where file name is given as argument.
5. WRITE A PROGRAM to copy files using system calls.
6. Write program to implement FCFS scheduling algorithm.
7. Write program to implement Round Robin scheduling algorithm.
8. Write program to implement SJF scheduling algorithm.
9. Write program to implement non-preemptive priority based scheduling algorithm.
10. Write program to implement preemptive priority based scheduling algorithm.
11. Write program to implement SRJF scheduling algorithm.
12. Write program to calculate sum of n numbers using thread library.
13. Write a program to implement first-fit, best-fit and worst-fit allocation strategies.

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed

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CO1	Understanding various functions, structures and history of operating systems and should be able to define objectives of modern operating systems and describe how operating systems have evolved over time.	R(1), U(2)	PO1	PSO1
CO2	Describe the important computer system resources and the role of operating system in their management policies and algorithms.	U(2)	PO2	PSO2 PSO3
CO3	Understanding of design issues, various process management concepts, scheduling, synchronization, and deadlocks associated with operating systems.	U(2)	PO2	PSO2 PSO3
CO4	Understanding about multithreading, concepts of memory management including virtual memory, file system interface and implementation, disk management.	U(2)	PO3	PSO1 PSO2
CO5	Describe the functions of a contemporary operating system with respect to convenience, efficiency, and the ability to adapt to different operating systems.	U(2)	PO2 PO4	PSO1 PSO4
CO6	Ability to categorise and identify potential threats to operating systems and will have the ability to explain the design criteria of the security features to guard against them.	An(4), E(5)	PO4 PO5	PSO4 PSO6

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating

Reference Books

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
4. W. Stallings, Operating Systems, Internals & Design Principles , 5th Edition, Prentice Hall of India. 2008.
5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

SEMESTER- III
Name of the course: **Computer Networks** → 100% modification
Course code: **UGCMSCC07**
Total Class Hours: **120** Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. Knowledge of contemporary issues in network technologies.
2. Knowledge of different network models and there functionalities.

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3. Capability to understand design issues of WAN, LAN and wireless networks, its network configuration and maintenance along with the fundamentals of network security.

SYLLABUS

A Theory (60 Hours) — 4 Credits

1. **Introduction to Computer Networks** (8 L)

   Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite.

2. **Data Communication Fundamentals and Techniques** (10 L)

   Analog and digital signal; data-rate limits; digital to digital line encoding schemes; pulse code modulation; parallel and serial transmission; digital to analog modulation-; multiplexing techniques- FDM, TDM; transmission media.

3. **Networks Switching Techniques and Access mechanisms** (10 L)

   Circuit switching; packet switching- connectionless datagram switching, connection-oriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.

4. **Data Link Layer Functions and Protocol** (10 L)

   Error detection and error correction techniques; data-link control- framing and flow control; error recovery protocols- stop and wait ARQ, go-back-n ARQ; Point to Point Protocol on Internet.

5. **Multiple Access Protocol and Networks** (5 L)

   CSMA/CD protocols; Ethernet LANS; connecting LAN and back-bone networks- repeaters, hubs, switches, bridges, router and gateways.

6. **Networks Layer Functions and Protocols** (6 L)

   Routing; routing algorithms; network layer protocol of Internet- IP protocol, Internet control protocols.

7. **Transport Layer Functions and Protocol** (6 L)

   Transport services- error and flow control, Connection establishment and release- three-way handshake.

8. **Overview of Application layer protocol** (5 L)

   Overview of DNS protocol; overview of WWW & HTTP protocol.

B Practical (60 Hours) — 2 Credits

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm
6. Simulate and implement Dijkstra algorithm for shortest path routing.

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Familiarize with contemporary issues in network technologies.	R(1)	PO1	PSO1
CO2	Know the layered model approach explained in OSI and TCP/IP network models and Identify different types of network devices and their functions within a network.	R(1)	PO1	PSO1
CO3	Understand the structure of Data Communications System and its components. Be familiarize with different network terminologies	R(1), U(2)	PO2	PSO1 PSO2
CO4	Learn and illustrate the basic routing mechanisms, IP addressing scheme and internetworking concepts	Ap (3)	PO3	PSO3 PSO4
CO5	Able to analyse the IP and TCP Internet protocols.	An(4)	PO4	PSO4
CO6	Ability to understand and determine the major design issues of WAN, LAN and wireless networks, its network configuration and maintenance along with the fundamentals of network security.	E(5)	PO5 PO6	PSO5 PSO6

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Reference Books

1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM ,2007.
2. S. Tanenbaum: Computer Networks, Fourth edition, PHI , 2002

SEMESTER- IV
Name of the course: **Design and Analysis of Algorithms** → 100% modification
Course code: **UGCMSCC08**
Total Class Hours: **120** Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. Understating of design aspects of different computational algorithms.

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2. To gain the capability of estimating cost of devising an algorithm.
3. Capability to apply the knowledge of algorithm design for practical problem solving.

SYLLABUS

A Theory (60 Hours) **4 Credits**

1. **Introduction** (5 L)
   Basic Design and Analysis techniques of Algorithms, Correctness of Algorithm.
2. **Algorithm Design Techniques** (5 L)
   Iterative techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms.
3. **Sorting and Searching Techniques** (20 L)
   Elementary sorting techniques–Bubble Sort, Insertion Sort, Merge Sort, Advanced Sorting techniques - Heap Sort, Quick Sort, Sorting in Linear Time - Bucket Sort, Radix Sort and Count Sort, Searching Techniques, Medians & Order Statistics, complexity analysis.
4. **Lower Bounding Techniques** (5 L)
   Decision Trees
5. **Balanced Trees** (7 L)
   Red-Black Trees
6. **Advanced Analysis Technique** (5 L)
   Amortized analysis
7. **Graphs** (5 L)
   Graph Algorithms–Breadth First Search, Depth First Search and its Applications, Minimum Spanning Trees.
8. **String Processing** (5 L)
   String Matching, KMP Technique

B Practical (60 Hours) **2 Credits**

1. Implement Insertion Sort (The program should report the number of comparisons)
2. Implement Merge Sort (The program should report the number of comparisons)
3. Implement Heap Sort (The program should report the number of comparisons)
4. Implement Randomized Quick sort (The program should report the number of comparisons)
5. Implement Count Sort
6. Implement Radix Sort
7. Implement a dynamic array to insert N numbers N times and find the amortized cost of it.
8. Implement Breadth-First Search in a graph

9. Implement Depth-First Search in a graph
10. Write a program to determine the minimum spanning tree of a graph
11. For the algorithms at S. No. 1 to 4 test run the algorithm on 100 different inputs of sizes varying from 30 to 1000. Count the number of comparisons and draw the graph. Compare it with a graph of nlogn.
12. Create a Red-Black Tree and perform following operations on it:

    Insert a node

    Delete a node

    Search for a number & also report the color of the node containing this number.

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Ability to define how to analyse algorithms and estimate their worst-case and average-case behaviour.	R(1)	PO1	PSO1
CO2	Ability to understand good principles of algorithm design.	U(2)	PO2	PSO1 PSO2
CO3	Ability to analyse and be accustomed to the description of algorithms in both functional and procedural styles.	An(4)	PO4	PSO4
CO4	Ability to apply their theoretical knowledge in practice and design algorithms for problem solving.	Ap(3), C(6)	PO6	PSO6

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Reference Books

1. T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein Introduction to Algorithms, PHI, 3rd Edition 2009
2. Sarabasse & A.V. Gelder Computer Algorithm – Introduction to Design and Analysis, Publisher – Pearson 3rd Edition 1999

SEMESTER- IV
Name of the course: **Software Engineering** →100% modification
Course code: **UGCMSCC09**
Total Class Hours: **120** Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. Basic knowledge and understanding of design of software development.

2. Understanding of effective time and resource management for real world software development.

SYLLABUS

A Theory (60 Hours) **4 Credits**

1. **Introduction** (8 L)

   The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI).

2. **Requirement Analysis** (10 L)

   Software Requirement Analysis, Initiating Requirement Engineering Process, Requirement Analysis and Modeling Techniques, Flow Oriented Modeling, Need for SRS, Characteristics and Components of SRS.

3. **Software Project Management** (8 L)

   Estimation in Project Planning Process, Project Scheduling.

4. **Risk Management** (8 L)

   Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan.

5. **Quality Management** (8 L)

   Quality Concepts, Software Quality Assurance, Software Reviews, Metrics for Process and Projects.

6. **Design Engineering** (10 L)

   Design Concepts, Architectural Design Elements, Software Architecture, Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture, Modeling Component Level Design.

7. **Testing Strategies & Tactics** (8 L)

   Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System testing, Black-Box Testing, White- Box Testing and their type, Basis Path Testing.

B Practical (60 Hours) **2 Credits**

S. No	Practical Title
1.	Problem Statement, Process Model

2.	Requirement Analysis: Creating a Data Flow Data Dictionary, Use Cases
3.	Project Management: Computing FP Effort Schedule, Risk Table, Timeline chart
4.	Design Engineering: Architectural Design Data Design, Component Level Design
5.	Testing: Basis Path Testing

Sample Projects:

1. Criminal Record Management: Implement a criminal record management system for jailers, police officers and CBI officers
2. DTC Route Information: Online information about the bus routes and their frequency and fares
3. Car Pooling: To maintain a web based intranet application that enables the corporate employees within an organization to avail the facility of carpooling effectively.
4. Patient Appointment and Prescription Management System
5. Organized Retail Shopping Management Software
6. Online Hotel Reservation Service System
7. Examination and Result computation system
8. Automatic Internal Assessment System
9. Parking Allocation System
10. Wholesale Management System

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Ability to define and understand the analysis and design of complex software systems.	R(1), U(2)	PO1 PO2	PSO1 PSO2

CO2	Ability to apply software engineering principles and techniques.	Ap(3)	PO3	PSO2 PSO3
CO3	To manage time, processes and resources effectively by prioritising competing demands to achieve personal and team goals Identify and analyses the common threats in each domain.	An(4)	PO4	PSO4 PSO5
CO4	Ability to work as an effective member or leader of software engineering teams.	E(5)	PO5	PSO2 PSO5
CO5	Ability to develop efficient, reliable, robust and cost-effective software solutions.	C(6)	PO6	PSO6

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Reference Books

1. R.S. Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw-Hill, 2009.
2. P. Jalote, An Integrated Approach to Software Engineering (2nd Edition), Narosa Publishing House, 2003.
3. K.K. Aggarwal and Y. Singh, Software Engineering (2nd Edition), New Age International Publishers, 2008.
4. I. Sommerville, Software Engineering (8th edition), Addison Wesley, 2006.
5. D. Bell, Software Engineering for Students (4th Edition), Addison-Wesley, 2005.
6. R. Mall, Fundamentals of Software Engineering (2nd Edition), Prentice-Hall of India, 2004.

SEMESTER- IV
Name of the course: **Database Management Systems** → 100% modification
Course code: **UGCMSCC10**
Total Class Hours: **120** Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. Gain knowledge of database systems and database management systems software, formulate, using SQL, solutions to a broad range of query and data update problems.
2. Be acquainted with the basics of transaction processing and concurrency control and understand the database storage structures and access techniques.
3. Understanding of normalization theory and apply such knowledge to the normalization of a database.

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A Theory (60 Hours) **4 Credits**

1. **Introduction** (6 L)

   Characteristics of database approach, data models, database system architecture and data independence.

2. **Entity Relationship(ER) Modelling** (8 L)

   Entity types, relationships, constraints.

3. **Relation data model** (20 L)

   Relational model concepts, relational constraints, relational algebra, SQL queries.

4. **Database design** (15 L)

   Mapping ER/EER model to relational database, functional dependencies, Lossless decomposition, Normal forms (upto BCNF).

5. **Transaction Processing** (3 L)

   ACID properties, concurrency control.

6. **File Structure and Indexing** (8 L)

   Operations on files, File of Unordered and ordered records, overview of File organizations, Indexing structures for files (Primary index, secondary index, clustering index), Multilevel indexing using B and B+ trees.

B Practical (60 Hours) **2 Credits**

Create and use the following database schema to answer the given queries.

EMPLOYEE Schema

Field	Type	NULL	KEY	DEFAULT
Eno	Char(3)	No	PRI	NIL
Ename	Varchar(50)	No		NIL
Job_type	Varchar(50)	No		NIL
Manager	Char(3)	Yes	FK	NIL
Hire_date	Date	No		NIL
Dno	Integer	Yes	FK	NIL
Commission	Decimal(10,2)	Yes		NIL
Salary	Decimal(7,2)	No		NIL

DEPARTMENT Schema

Field	Type	NULL	KEY	DEFAULT
Dno	Integer	No	PRI	NULL
Dname	Varchar(50)	Yes		NULL
Location	Varchar(50)	Yes		New Delhi

Query List

1. Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
2. Query to display unique Jobs from the Employee Table.
3. Query to display the Employee Name concatenated by a Job separated by a comma.
4. Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
5. Query to display the Employee Name and Salary of all the employees earning more than $2850.
6. Query to display Employee Name and Department Number for the Employee No= 7900.
7. Query to display Employee Name and Salary for all employees whose salary is not in the range of $1500 and $2850.
8. Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.
9. Query to display Name and Hire Date of every Employee who was hired in 1981.
10. Query to display Name and Job of all employees who don't have a current Manager.
11. Query to display the Name, Salary and Commission for all the employees who earn commission.
12. Sort the data in descending order of Salary and Commission.
13. Query to display Name of all the employees where the third letter of their name is A.
14. Query to display Name of all employees either have two R's or have two A's in their name and are either in Dept No = 30 or their Manger's Employee No = 7788.
15. Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.
16. Query to display the Current Date.
17. Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.
18. Query to display Name and calculate the number of months between today and the date each employee was hired.
19. Query to display the following for each employee <E-Name> earns < Salary> monthly but wants < 3 * Current Salary >. Label the Column as Dream Salary.
20. Query to display Name with the 1st letter capitalized and all other letter lower case and length

of their name of all the employees whose name starts with 'J', 'A' and 'M'.

21. Query to display Name, Hire Date and Day of the week on which the employee started.
22. Query to display Name, Department Name and Department No for all the employees.
23. Query to display Unique Listing of all Jobs that are in Department # 30.
24. Query to display Name, Dept Name of all employees who have an 'A' in their name.
25. Query to display Name, Job, Department No. And Department Name for all the employees working at the Dallas location.
26. Query to display Name and Employee no. Along with their Manger's Name and the Manager's employee no; along with the Employees' Name who do not have a Manager.
27. Query to display Name, Dept No. And Salary of any employee whose department No. and salary matches both the department no. And the salary of any employee who earns a commission.
28. Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies
29. $100.
30. Query to display the Highest, Lowest, Sum and Average Salaries of all the employees
31. Query to display the number of employees performing the same Job type functions.
32. Query to display the no. of managers without listing their names.
33. Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
34. Query to display Name and Hire Date for all employees in the same dept. as Blake.
35. Query to display the Employee No. And Name for all employees who earn more than the average salary.
36. Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a 'T'.
37. Query to display the names and salaries of all employees who report to King.
38. Query to display the department no, name and job for all employees in the Sales department.

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Ability to define the database systems and database management systems software, formulate, using SQL, solutions to a broad range of query and data update problems	R(1)	PO1	PSO1

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CO2	Ability to understand the basics of transaction processing and concurrency control and understand the database storage structures and access techniques.	U(2)	PO2	PSO1 PSO2
CO3	Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.	Ap(3)	PO3	PSO2
CO4	Compare, contrast and analyse the various emerging technologies for database systems.	An(4)	PO4	PSO3 PSO4
CO5	Analyse strengths and weaknesses of the applications of database technologies to various subject areas.	E(5)	PO4	PSO4
CO6	Ability to model data in applications using conceptual modelling tools such as ER Diagrams and design data base schemas based on the model.	C(6)	PO6	PSO6

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating

Reference Books

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education, 2010.
2. R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002.
3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6th Edition, Pearson Education, 2013.

SEMESTER- V
Name of the course: **Internet Technologies** →100% modification
Course code: **UGCMSCC11**
Total Class Hours: **120** Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. Knowledge of the design and functionality of Internet and the issues related to it.
2. Capability to develop basic webpages and other internet based services.

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A Theory (60 Hours) **4 Credits**

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1. **Java** (5 L)

   Use of Objects, Array and Array List class

2. **JavaScript** (15 L)

   Data types, operators, functions, control structures, events and event handling.

3. **JDBC** (10 L)

   JDBC Fundamentals, Establishing Connectivity and working with connection interface, Working with statements, Creating and Executing SQL Statements, Working with Result Set Objects.

4. **JSP** (20 L)

   Introduction to Java Server Pages, HTTP and Servlet Basics, The Problem with Servlets, The Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment, Implicit JSP Objects, Conditional Processing, Displaying Values, Using an expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data Between JSP Pages, Requests, and Users, Database Access.

5. **Java Beans** (10 L)

   Java Beans Fundamentals, JAR files, Introspection, Developing a simple Bean, Connecting to DB.

B Practical (60 Hours) **2 Credits**

1. Create event driven program for following:
2. Print a table of numbers from 5 to 15 and their squares and cubes using alert.
3. Print the largest of three numbers.
4. Find the factorial of a number n.
5. Enter a list of positive numbers terminated by Zero. Find the sum and average of these numbers.
6. A person deposits ₹1000 in a fixed account yielding 5% interest. Compute the amount in the account at the end of each year for n years.
7. Read n numbers. Count the number of negative numbers, positive numbers and zeros in the list.

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Ability to define the terms related to the Internet and how the Internet is changing the world	R(1)	PO1	PSO1

CO2	To understand how computers are connected to the Internet and demonstrate the ability to use the World Wide Web	U(2)	PO2	PSO1 PSO2
CO3	Demonstrate the ability to make use of electronic mail and other internet based services.	Ap(3)	PO4	PSO3
CO4	Compare and analyse the design principles of Web pages and how they are created.	An(4)	PO4	PSO4
CO5	To develop an ability to create basic Web pages with HTML	C(6)	PO4	PSO6

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Reference Books

1. Ivan Bayross, Web Enabled Commercial Application Development Using Html, Dhtml, javascript, Perl Cgi , BPB Publications, 2009.
2. Cay Horstmann, BIG Java, Wiley Publication, 3rd Edition., 2009
3. Herbert Schildt , Java 7, The Complete Reference, , 8th Edition, 2009.
4. Jim Keogh,The Complete Reference J2EE, TMH, , 2002.
5. O'Reilly, Java Server Pages, Hans Bergsten, Third Edition, 2003.

SEMESTER- V	
Name of the course: **Theory of Computation** → 100% modification	
Course code: **UGCMSCC11**	
Total Class Hours: **90**	Credit: **6 (Theory)**

Course Objectives:

1. Knowledge and understanding of formal connection between algorithmic problem solving and the theory of languages.
2. Understand the key topics of theory of computation, and to have the opportunity to explore the current topics in this area.

SYLLABUS

A Theory (90 Hours) **6 Credits**

1. **Languages** (15 L)

   Alphabets, string, language, Basic Operations on language, Concatenation, KleeneStar

2. **Finite Automata and Regular Languages** (25 L)

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Regular Expressions, Transition Graphs, Deterministic and non-deterministic finite automata, NFA to DFA Conversion, Regular languages and their relationship with finite automata, Pumping lemma and closure properties of regular languages.

3. **Context free languages** (25 L)

   Context free grammars, parse trees, ambiguities in grammars and languages, Pushdown automata (Deterministic and Non-deterministic), Pumping Lemma, Properties of context free languages, normal forms.

4. **Turing Machines and Models of Computations** (25 L)

   RAM, Turing Machine as a model of computation, Universal Turing Machine, Language acceptability, decidability, halting problem, Recursively enumerable and recursive languages, unsolvability problems.

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	To understand a formal connection between algorithmic problem solving and the theory of languages.	U(2)	PO2	PSO1
CO2	Ability to identify the practical view towards the applications of these ideas in the engineering part as well.	Ap(3)	PO2	PSO2
CO3	Become proficient in key topics of theory of computation, and to have the opportunity to explore the current topics in this area.	An(4)	PO4	PSO3
CO4	Evaluate and develop by applying the theoretical knowledge into a mathematical (abstract) view towards algorithmic design and in general computation itself.	E (5), C(6)	PO5	PSO5

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Reference Books

1. Daniel I.A.Cohen, Introduction to computer theory, John Wiley,1996
2. Lewis & Papadimitriou, Elements of the theory of computation, PHI 1997.
3. Hoperoft, Aho, Ullman, Introduction to Automata theory, Language & Computation 3rd Edition, Pearson Education. 2006
4. P. Linz, An Introduction to Formal Language and Automata 4th edition Publication Jones Bartlett, 2006

SEMESTER- VI

Name of the course: **Artificial Intelligence** → 100% modification
Course code: **UGCMSCC13**
Total Class Hours: **120** Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. Knowledge of the basic of artificial intelligence techniques such as search problems, constraint satisfaction problem, as a planning problem, constraint propagation algorithms, etc.
2. Understanding the capabilities and limitations of artificial intelligence techniques

SYLLABUS

A Theory (60 Hours) **4 Credits**

1. **Introduction** (6 L)

   Introduction to Artificial Intelligence, Background and Applications, Turing Test and Rational Agent approaches to AI, Introduction to Intelligent Agents, their structure, behaviour and environment.

2. **Problem Solving and Searching Techniques** (20 L)

   Problem Characteristics, Production Systems, Control Strategies, Breadth First Search, Depth First Search, Hill climbing and its Variations, Heuristics Search Techniques: Best First Search, A* algorithm, Constraint Satisfaction Problem, Means-End Analysis, Introduction to Game Playing, Min-Max and Alpha-Beta pruning algorithms.

3. **Knowledge Representation** (20 L)

   Introduction to First Order Predicate Logic, Resolution Principle, Unification, Semantic Nets, Conceptual Dependencies, Frames, and Scripts, Production Rules, Conceptual Graphs. Programming in Logic (PROLOG)

4. **Dealing with Uncertainty and Inconsistencies** (8 L)

   Truth Maintenance System, Default Reasoning, Probabilistic Reasoning, Bayesian Probabilistic Inference, Possible World Representations.

5. **Understanding Natural Languages** (6 L)

   Parsing Techniques, Context-Free and Transformational Grammars, Recursive and Augmented Transition Nets.

B Practical (60 Hours) **2 Credits**

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1. Write a prolog program to calculate the sum of two numbers.
2. Write a prolog program to find the maximum of two numbers.
3. Write a prolog program to calculate the factorial of a given number.
4. Write a prolog program to calculate the nth Fibonacci number.
5. Write a prolog program, insert_nth(item, n, into_list, result) that asserts that result is the list into_list with item inserted as the nth element into every list at all levels.
6. Write a Prolog program to remove the Nth item from a list.
7. Write a Prolog program, remove-nth(Before, After) that asserts the After list is the Before list with the removal of every nth item from every list at all levels.
8. Write a Prolog program to implement append for two lists.
9. Write a Prolog program to implement palindrome(List).
10. Write a Prolog program to implement max(X,Y,Max) so that Max is the greater of two numbers X and Y.
11. Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number in the list of numbers List.
12. Write a Prolog program to implement sumlist(List,Sum) so that Sum is the sum of a given list of numbers List.
13. Write a Prolog program to implement two predicates evenlength(List) and oddlength(List) so that they are true if their argument is a list of even or odd length respectively.
14. Write a Prolog program to implement reverse(List,ReversedList) that reverses lists.
15. Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number in the list of numbers List using cut predicate.
16. Write a Prolog program to implement GCD of two numbers.
17. Write a prolog program that implements Semantic Networks/Frame Structures.

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Ability to explain what constitutes "Artificial" Intelligence and how to identify systems with Artificial Intelligence.	U(2)	PO2	PSO2
CO2	Explain the limitations of current Artificial Intelligence techniques.	U(2)	PO2	PSO2
CO3	Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.	Ap(3)	PO4	PSO3 PSO4

CO4	Categorize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, etc).	An(4)	PO4	PSO4
CO5	Evaluate and implement basic AI algorithms (e.g., standard search or constraint propagation algorithms).	E(5)	PO5	PSO4
CO6	Design and perform an empirical evaluation of different algorithms on a problem formalisation, and state the conclusions that the evaluation supports.	C(6)	PO6	PSO6

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating

Reference Books

1. DAN.W. Patterson, Introduction to A.I and Expert Systems – PHI, 2007.
2. Russell & Norvig, Artificial Intelligence-A Modern Approach, LPE, Pearson Prentice Hall, 2nd edition, 2005.
3. Rich & Knight, Artificial Intelligence – Tata McGraw Hill, 2nd edition, 1991.
4. W.F. Clocksin and Mellish, Programming in PROLOG, Narosa Publishing House, 3rd edition, 2001.
5. Ivan Bratko, Prolog Programming for Artificial Intelligence, Addison-Wesley, Pearson Education, 3rd edition, 2000.

SEMESTER- VI	
Name of the course: **Computer Graphics** → 100% modification	
Course code: **UGCMSCC14**	
Total Class Hours: **120**	Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. Basic knowledge of design and implementation issues of computer graphics.
2. Understanding of the relevant mathematics and different algorithms for generation of computer graphics.
3. Understanding of fundamentals of animation and virtual reality technologies.

SYLLABUS

A Theory (60 Hours) **4 Credits**

1. **Introduction** (5 L)

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Basic elements of Computer graphics, Applications of Computer Graphics.

2. **Graphics Hardware** (8 L)

   Architecture of Raster and Random scan display devices, input/output devices.

3. **Fundamental Techniques in Graphics** (22 L)

   Raster scan line, circle and ellipse drawing, thick primitives, Polygon filling, line and polygon clipping algorithms, 2D and 3D Geometric Transformations, 2D and 3D Viewing Transformations (Projections- Parallel and Perspective), Vanishing points.

4. **Geometric Modelling** (10 L)

   Representing curves & Surfaces.

5. **Visible Surface determination** (8 L)

   Hidden surface elimination.

6. **Surface rendering** (7 L)

   Illumination and shading models. Basic color models and Computer Animation.

B Practical (60 Hours) **2 Credits**

1. Write a program to implement Bresenham's line drawing algorithm.
2. Write a program to implement mid-point circle drawing algorithm.
3. Write a program to clip a line using Cohen and Sutherland line clipping algorithm.
4. Write a program to clip a polygon using Sutherland Hodgeman algorithm.
5. Write a program to apply various 2D transformations on a 2D object (use homogenous coordinates).
6. Write a program to apply various 3D transformations on a 3D object and then apply parallel and perspective projection on it.
7. Write a program to draw Hermite/Bezier curve.

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Ability to recall the concepts and relevant mathematics of computer graphics.	R(1)	PO1	PSO1
CO2	Ability to describe the importance of viewing and projections and define the fundamentals of animation and Virtual reality technologies	U(2)	PO2	PSO1 PSO2

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CO3	Ability to apply various algorithms to scan, convert the basic geometrical primitives, transformations, area filling, clipping.	Ap(3)	PO4	PSO3 PSO4
CO4	Ability to design basic graphics application programs that display graphic images to given specifications.	C(6)	PO5	PSO5 PSO6

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Reference Books

1. J.D.Foley, A.Van Dan, Feiner, Hughes Computer Graphics Principles & Practice 2nd edition Publication Addison Wesley 1990.
2. D.Hearn, Baker: Computer Graphics, Prentice Hall of India 2008.
3. D.F.Rogers Procedural Elements for Computer Graphics, McGraw Hill 1997.
4. D.F.Rogers, Adams Mathematical Elements for Computer Graphics, McGraw Hill 2nd edition 1989.

Discipline Specific Elective Courses — Credit: 6 each

Name of the course: **Microprocessor** → 100% modification
Course code: **UGCMSDSE01**
Total Class Hours: **120** Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. To make students understand the basic architecture, operation and applications of Microprocessor.
2. To understand the basic concepts of microprocessor up gradation and their advantages over older versions.
3. To make students know the different ways of communicating with internal and external I/O devices.

SYLLABUS

A Theory (60 Hours) **4 Credits**

1. **Microprocessor architecture** (10 L)
   Internal architecture, system bus architecture, memory and I/O interfaces.
2. **Microprocessor programming** (20 L)
   Register Organization, instruction formats, assembly language programming.
3. **Interfacing** (30 L)
   Memory address decoding, cache memory and cache controllers, I/O interface, keyboard, display, timer, interrupt controller, DMA controller, video controllers, communication interfaces.

B Practical (60 Hours) **2 Credits**

ASSEMBLY LANGUAGE PROGRAMMING

1. Write a program for binary division and multiplication
2. Write a program for BCD addition and subtraction
3. Write a program for Linear search and binary search.
4. Write a program to add and subtract two arrays
5. Write a program for binary to ascii conversion

6. Write a program for ascii to binary conversion
7. Write a program for Palindrome checking
8. Write a program for Fibonacci series generation
9. Write a program for AP/GP series generation
10. Write a program to implement bubble short, merge short
11. Write a program for block transfer

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Ability to define the basic architecture, operation and applications of Microprocessor.	R(1)	PO1	PSO1
CO2	Ability to understand interrupts as well as their usage in different hardware approaches.	U(2)	PO2	PSO1
CO3	Ability to analyse the basic architecture of upgraded microprocessor and their advantages over older versions.	An(4)	PO4	PSO3 PSO4
CO4	Ability to evaluate different ways of communicating with internal and external I/O devices.	E(5)	PO5	PSO5

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Recommended Books:

1. Gaonkar Ramesh S.: Microprocessor Architecture, Programming and Applications with the 8085, Willy Eastern Ltd., 2014
2. Barry B. Brey: The Intel Microprocessors: Architecture, Programming and Interfacing.Pearson Education, 6th Edition,2009.
3. Walter A Triebel, Avtar Singh; The 8088 and 8086 Microprocessors Programming, Interfacing, Software, Hardware, and Applications. PHI, 4th Edition 2005.

Name of the course: **Numerical Methods** → 100% modification
Course code: **UGCMSDSE02**
Total Class Hours: **120** Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. To understand the underlying mathematical formulations of various numeral methods.

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2. To understand the Bisection method, Secant method, Regula-Falsi method, Newton-Raphson method and different approaches of respective methods.

3. To gain the ability to design Computer Algebra Systems using MATLAB / MATHEMATICA / MAPLE for real world applications.

SYLLABUS

A Theory (60 Hours) **4 Credits**

1. **Introduction:** (10 L)

   Floating point representation and computer arithmetic, Significant digits, Errors: Round-off error, Local truncation error, Global truncation error, Order of a method, Convergence and terminal conditions, Efficient computations

2. **Bisection, Secant, Newton–Raphson, Gauss–Jordan method:** (15 L)

   Bisection method, Secant method, Regula–Falsi method, Newton–Raphson method, Newton's method for solving nonlinear systems, Gauss elimination method Gauss elimination method (with row pivoting) and Gauss–Jordan method, Gauss Thomas method for tridiagonal systems

3. **Iterative methods:** (3 L)

   Jacobi and Gauss-Seidel iterative methods

4. **Interpolation:** (7 L)

   Lagrange's form and Newton's form Finite difference operators, Gregory Newton forward and backward differences Interpolation

5. **Piecewise polynomial interpolation:** (10 L)

   Linear interpolation, Cubic spline interpolation (only method), Numerical differentiation: First and second order derivatives, Richardson extrapolation Numerical integration: Trapezoid rule, Simpson's rule (only method), Newton–Cotes open formulas

6. **Extrapolation methods:** (5 L)

   Romberg integration, Gaussian quadrature, Ordinary differential equation: Euler's method

7. **Modified Euler's methods:** (10 L)

   Heun method and Mid-point method, Runge-Kutta second methods: Heun method without iteration, Mid-point method and Ralston's method Classical 4th order Runge-Kutta method, Finite difference method for linear ODE

B Practical (60 Hours) **2 Credits**

1. Find the roots of the equation by bisection method.

2. Find the roots of the equation by secant/Regula–Falsi method.
3. Find the roots of the equation by Newton's method.
4. Find the solution of a system of nonlinear equation using Newton's method.
5. Find the solution of tridiagonal system using Gauss Thomas method.
6. Find the solution of system of equations using Jacobi/Gauss-Seidel method.
7. Find the cubic spline interpolating function.
8. Evaluate the approximate value of finite integrals using Gaussian/Romberg integration.
9. Solve the boundary value problem using finite difference method.

Note: Programming is to be done in any one of Computer Algebra Systems:
MATLAB / MATHEMATICA / MAPLE.

Course Outcomes

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Understand the underlying mathematical formulations across various numerical analysis rules and methods.	U(2)	PO2	PSO2
CO2	Categorize between Bisection method, Secant method, Regula–Falsi method, Newton–Raphson method and different approaches of respective methods.	An(4)	PO4	PSO3 PSO4
CO3	Ability to choose appropriate algorithm for solving different problems.	E(5)	PO5	PSO5
CO4	Design and adapt existing approaches to suit applications.	C(6)	PO6	PSO6
CO5	Design and implementation of Computer Algebra Systems for real world applications.	C(6)	PO6	PSO6

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Reference Books

1. Laurence V. Fausett, Applied Numerical Analysis, Using MATLAB, Pearson, 2/e (2012)
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publisher, 6/e (2012)
3. Steven C Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, Tata McGraw Hill, 2/e (2010)

Name of the course: **Cloud Computing** → 100% modification
Course code: **UGCMSDSE03**
Total Class Hours: **120** Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. To understand the trade-offs between deploying applications in the cloud and over the local infrastructure
2. To be able to program data intensive parallel applications in the cloud
3. Ability to deploy applications over commercial cloud computing infrastructures such as Amazon Web Services, Windows Azure, and Google AppEngine.

SYLLABUS

A Theory (60 Hours) **4 Credits**

1. **Overview of Computing Paradigm** (8 L)

   Recent trends in Computing: Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing
2. **Introduction to Cloud Computing** (7 L)

   Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Benefits and limitations of Cloud Computing
3. **Cloud Computing Architecture** (20 L)

   Comparison with traditional computing architecture (client/server), Services provided at various levels, Service Models- Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), How Cloud Computing Works, Deployment Models- Public cloud, Private cloud, Hybrid cloud, Community cloud, Case study of NIST architecture.
4. **Case Studies** (13 L)

   Case study of Service model using Google App Engine, Microsoft Azure, Amazon EC2, Eucalyptus.
5. **Service Management in Cloud Computing** (7 L)

   Service Level Agreements (SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling.
6. **Cloud Security** (5 L)

Infrastructure Security- Network level security, Host level security, Application level security, Data security and Storage- Data privacy and security Issues, Jurisdictional issues raised by Data location, Authentication in cloud computing.

B Practical (60 Hours) **2 Credits**

1. Create virtual machines that access different programs on same platform.
2. Create virtual machines that access different programs on different platforms.
3. Working on tools used in cloud computing online-
4. Storage
5. Sharing of data
6. Manage your calendar, to-do lists,
7. A document editing tool
8. Exploring Google cloud
9. Exploring Microsoft cloud
10. Exploring Amazon cloud

Course Outcomes

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Understanding of deploying applications over commercial cloud computing infrastructures.	U(2) Ap(3)	PO2	PSO2 PSO3
CO2	Compare the advantages and disadvantages of various cloud computing platforms	An(4)	PO4	PSO4
CO3	Analyse the trade-offs between deploying applications in the cloud and over the local infrastructure	An(4)	PO4	PSO4
CO4	Analyse the performance, scalability, availability of the underlying cloud technologies and software and also identify security and privacy issues in cloud computing	An(4)	PO4	PSO4
CO5	Explain recent research results in cloud computing and identify their pros and cons.	E(5)	PO5	PSO5 PSO6
CO6	Design programs for applications in the cloud to solve real-world problem using cloud computing through group collaboration.	C(6)	PO6	PSO6

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating

Reference Books

1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

2. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011
3. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012
4. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010
5. Gautam Shroff, Enterprise Cloud Computing Technology Architecture Applications , Adobe Reader ebooks available from eBooks.com,2010
6. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach, McGraw Hills, 2010.
7. Dimitris N. Chorafas, Cloud Computing Strategies ,CRC Press, 2010

Name of the course: **Machine Learning** → 100% modification
Course code: **UGCMSDSE04**
Total Class Hours: **120** Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. Basic knowledge of the underlying mathematical relationships across various machine learning algorithms.
2. Capability to apply the knowledge of machine learning algorithms on real world data for practical understanding of advanced soft computing applications.

SYLLABUS

A Theory (60 Hours) **4 Credits**

1. **Introduction** (15 L)

   Concept of Machine Learning, Applications of Machine Learning, Key elements of Machine Learning, Supervised vs. Unsupervised Learning, Statistical Learning: Bayesian Method, The Naive Bayes Classifier
2. **Software for Machine Learning and Linear Algebra Overview:** (5 L)

   Plotting of Data, Vectorization, Matrices and Vectors: Addition, Multiplication, Transpose and Inverse using available tool such as MATLAB.
3. **Linear Regression** (10 L)

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Prediction using Linear Regression, Gradient Descent, Linear Regression with one variable, Linear Regression with multiple variables, Polynomial Regression, Feature Scaling / Selection.

4. **Logistic Regression** (10 L)

   Classification using Logistic Regression, Logistic Regression vs. Linear Regression, Logistic Regression with one variable and with multiple variables.

5. **Regularization:** (10 L)

   Regularization and its utility: The problem of Overfitting, Application of Regularization in Linear and Logistic Regression, Regularization and Bias/Variance.

6. **Neural Networks** (10 L)

   Introduction, Model Representation, Gradient Descent vs. Perceptron Training, Stochastic Gradient Descent, Multilayer Perceptrons, Multiclass Representation, Backpropagation Algorithm.

B Practical (60 Hours) **2 Credits**

For practical Labs for Machine Learning, students may use softwares like MATLAB/Octave or Python. For later exercises, students can create/use their own datasets or utilize datasets from online repositories like UCI Machine Learning Repository (http://archive.ics.uci.edu/ml/).

1. Perform elementary mathematical operations in Octave/MATLAB like addition, multiplication, division and exponentiation.
2. Perform elementary logical operations in Octave/MATLAB (like OR, AND, Checking for Equality, NOT, XOR).
3. Create, initialize and display simple variables and simple strings and use simple formatting for variable.
4. Create/Define single dimension / multi-dimension arrays, and arrays with specific values like array of all ones, all zeros, array with random values within a range, or a diagonal matrix.
5. Use command to compute the size of a matrix, size/length of a particular row/column, load data from a text file, store matrix data to a text file, finding out variables and their features in the current scope.
6. Perform basic operations on matrices (like addition, subtraction, multiplication) and display specific rows or columns of the matrix.
7. Perform other matrix operations like converting matrix data to absolute values, taking the

negative of matrix values, adding/removing rows/columns from a matrix, finding the maximum or minimum values in a matrix or in a row/column, and finding the sum of some/all elements in a matrix.

8. Create various type of plots/charts like histograms, plot based on sine/cosine function based on data from a matrix. Further label different axes in a plot and data in a plot.
9. Generate different subplots from a given plot and color plot data.
10. Use conditional statements and different type of loops based on simple example/s.
11. Perform vectorised implementation of simple matrix operation like finding the transpose of a matrix, adding, subtracting or multiplying two matrices.
12. Implement Linear Regression problem. For example, based on a dataset comprising of existing set of prices and area/size of the houses, predict the estimated price of a given house.
13. Based on multiple features/variables perform Linear Regression. For example, based on a number of additional features like number of bedrooms, servant room, number of balconies, number of houses of years a house has been built – predict the price of a house.
14. Implement a classification/ logistic regression problem. For example, based on different features of students' data, classify, whether a student is suitable for a particular activity. Based on the available dataset, a student can also implement another classification problem like checking whether an email is spam or not.
15. Use some function for regularization of dataset based on problem 14.
16. Use some function for neural networks, like Stochastic Gradient Descent or back propagation - algorithm to predict the value of a variable based on the dataset of problem 14.

Course Outcomes

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Understand the underlying mathematical relationships across various machine learning algorithms.	U(2)	PO2	PSO2
CO2	Categorize between supervised, unsupervised machine learning approaches	An(4)	PO4	PSO3 PSO4
CO3	Ability to choose appropriate machine learning algorithm for solving a problem	E(5)	PO5	PSO5
CO4	Design and adapt existing machine learning algorithms to suit applications	C(6)	PO6	PSO6
CO5	Design and implement machine learning algorithms to real world applications	C(6)	PO6	PSO6

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating

Reference Books

1. Ethem Alpaydin, "Introduction to Machine Learning" 2nd Edition, The MIT Press, 2009.
2. Tom M. Mitchell, "Machine Learning", 1st Edition by Tata McGraw-Hill Education, 2013.
3. Christopher M. Bishop, "Pattern Recognition and Machine Learning" by Springer, 2007.
4. Mevin P. Murphy, "Machine Learning: A Probabilistic Perspective" by The MIT Press, 2012.

Name of the course: **Data Mining** ⇒ 100% modification
Course code: **UGCMSDSE05**
Total Class Hours: **120** Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. Gaining the knowledge of clustering, classification, association finding, feature selection and visualisation on real world data.
2. To understand and apply data mining software and toolkits in a range of applications for data preparation, modelling and evaluation

SYLLABUS

A Theory (60 Hours) **4 Credits**

1. **Overview:** (20 L)
   Predictive and descriptive data mining techniques, supervised and unsupervised learning techniques, process of knowledge discovery in databases, pre-processing methods
2. **Data Mining Techniques:** (40 L)
   Association Rule Mining, classification and regression techniques, clustering, Scalability and data management issues in data mining algorithms, measures of interestingness

B Practical (60 Hours) **2 Credits**

For practical in Labs of Data Mining, students will be encouraged to use open source software like Weka, Rapidminer, R, Scilab etc. The inbuilt datasets of these tools can be used will be helpful for them.

The points planned to be covered include

1. Installing and Understanding the data mining tool(s).
2. Loading datasets into the interface.

3. Understanding the attributes of loaded dataset.
4. Cleaning of data
5. Data normalization
6. Attribute Selection
7. Dimensionality reduction
8. Classification
9. Clustering
10. Regression
11. Splitting of the data into Training and Testing
12. Cross validation
13. Use of some Supervised learning based classifiers

Apart from the given syllabus, some standard datasets freely available for research will also be used. Some small take home projects will also be given to the students for better understanding of the whole concept of data mining and their application in real world.

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Understand the techniques of clustering, classification, association finding, feature selection and visualisation on real world data.	U(2)	PO1 PO2	PSO2
CO2	Apply data mining concepts on real world data for analysis and development.	Ap(3)	PO2	PSO3
CO3	Ability to assess whether a real world problem has a data mining solution.	E(5)	PO5	PSO5
CO4	Ability to design a data mining process for an application, including data preparation, modelling and evaluation for research and development.	C(6)	PO6	PSO6

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Reference Books

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Education.2005.
2. Richard Roiger, Michael Geatz, Data Mining: A Tutorial Based Primer, Pearson Education 2003.
3. G.K. Gupta, Introduction to Data Mining with Case Studies, PHI,2006.

4. Soman K P, Diwakar Shyam, Ajay V Insight into Data Mining: Theory and Practice, PHI, 2006

Name of the course: **Dissertation / Project work** → 100% modification
Course code: **UGCMSDSE06**
Total Class Hours: **90** Credit: **6**

Course Objectives:

1. Opportunity to apply and extend material learned throughout the program.
2. Conceptual clarity about a certain state-of-the-art topic.
3. Understanding team work and development of social and professional skills

SYLLABUS **6 Credits**

An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his/her own with an advisory support by a teacher/faculty member is called dissertation/project.

The students will be allowed to work on any project based on the concepts studied in core / elective or skill based elective courses.

The group size should be maximum of three (03) students. Each group will be assigned a teacher as a supervisor who will handle both their theory as well lab classes.

Course Outcomes

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Understand project characteristics and various stages of a project	U(2)	PO2	PSO2
CO2	Understand the conceptual clarity about project organization and feasibility analyses.	U(2)	PO2	PSO2
CO3	Apply sound technical knowledge of their selected project topic in real life application development.	Ap(3)	PO4	PSO3
CO4	Analyse the learning and understand techniques for project planning, scheduling and execution control	An(4)	PO4	PSO4
CO5	Explain recent research oriented development of their selected project topic	E(5)	PO5	PSO5

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CO6	Ability to work in a team for well-planned design and development of futuristic applications.	C(6)	PO6	PSO5 PSO6

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Question Pattern for End Semester Examination:

Total Marks: 50 **Time: 2 Hours**

Group A

Q1. Answer any eight (8) questions from the following: **1 × 8 = 8**

Group B

Answer any three (3) questions from the following: **4 × 3 = 12**

Group C

Answer any three (3) questions from the following: **10×3 = 30**

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Generic Elective Courses

Credit: 6 each

Name of the course: **Computer Fundamentals** -> 100% modification
Course code: **UGCMSGE01**
Total Class Hours: **120** Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. Basic knowledge of the computer hardware and how software interacts with computer hardware and the concepts of addressing modes.
2. Gain knowledge of Boolean algebra and Boolean expressions.
3. Understanding of number systems and their use in computing environment.

SYLLABUS

A Theory (60 Hours)

1. **Introduction:** (6 L)
   Introduction to computer system, uses, types.
2. **Data Representation:** (12 L)
   Number systems and character representation, binary arithmetic
3. **Human Computer Interface:** (6 L)
   Types of software, Operating system as user interface, utility programs
4. **Devices:** (10 L)
   Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter
5. **Memory:** (6 L)
   Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks
6. **Computer Organisation and Architecture:** (12 L)
   C.P.U., registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors.
7. **Overview of Emerging Technologies:** (8 L)
   Bluetooth, cloud computing, big data, data mining, mobile computing and embedded systems.

B Practical (60 Hours)

Practical exercises based on MS Office/ Open Office tools using document preparation and spread sheet handling packages.

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MS Word

1. Prepare a grocery list having four columns (Serial number, The name of the product, quantity and price) for the month of April, 06.
   - Font specifications for Title (Grocery List): 14-point Arial font in bold and italics.
   - The headings of the columns should be in 12-point and bold.
   - The rest of the document should be in 10-point Times New Roman.
   - Leave a gap of 12-points after the title.
2. Create a telephone directory.
   - The heading should be 16-point Arial Font in bold
   - The rest of the document should use 10-point font size
   - Other headings should use 10-point Courier New Font.
   - The footer should show the page number as well as the date last updated.
3. Design a time-table form for your college.
   - The first line should mention the name of the college in 16-point Arial Font and should be bold.
   - The second line should give the course name/teacher name and the department in 14- point Arial.
   - Leave a gap of 12-points.
   - The rest of the document should use 10-point Times New Roman font.
   - The footer should contain your specifications as the designer and date of creation.
4. BPB Publications plans to release a new book designed as per your syllabus. Design the first page of the book as per the given specifications.
   - The title of the book should appear in bold using 20-point Arial font.
   - The name of the author and his qualifications should be in the center of the page in 16- point Arial font.
   - At the bottom of the document should be the name of the publisher and address in 16- point Times New Roman.
   - The details of the offices of the publisher (only location) should appear in the footer.
5. Create the following one page documents.
   a. Compose a note inviting friends to a get-together at your house, including a list of things to bring with them.
   b. Design a certificate in landscape orientation with a border around the document.
   c. Design a Garage Sale sign.
   d. Make a sign outlining your rules for your bedroom at home, using a numbered list.
6. Create the following documents:
   a. A newsletter with a headline and 2 columns in portrait orientation, including at least one image surrounded by text.
   b. Use a newsletter format to promote upcoming projects or events in your classroom or college.
7. Convert following text to a table, using comma as delimiter Type the following as shown (do not bold).

Color, Style,
Item Blue,
A980, Van
Red, X023,
Car
Green, YL724, Truck
Name, Age, Sex

Bob, 23, M

Linda, 46, F

Tom, 29, M

8. Enter the following data into a table given on the next page.

Salesperson	Dolls	Trucks	Puzzles
Kennedy, Sally	1327	1423	1193
White, Pete	1421	3863	2934
Pillar, James	5214	3247	5467
York, George	2190	1278	1928
Banks, Jennifer	1201	2528	1203
Atwater, Kelly	4098	3079	2067

9. Add a column Region (values: S, N, N,S,S,S) between the Salesperson and Dolls columns to the given table Sort your table data by Region and within Region by Salesperson in ascending order:
   In this exercise, you will add a new row to your table, place the word "Total" at the bottom of the Salesperson column, and sum the Dolls, Trucks, and Puzzles columns.
10. Wrapping of text around the image.
11. Following features of menu option must be
    covered FILE Complete menu
    EDIT Complete menu
    VIEW Complete menu
    INSERT Complete menu
    FORMAT Complete menu
    TABLE Complete
    menu WINDOW Complete
    menu HELP Complete
    menu
    TOOLS All options except Online collaboration, Tools on Macro, Templates

MS Excel

1. Enter the Following data in Excel Sheet

		REGIONAL SALES PROJECTION				
State	**Qtr1**	**Qtr2**	**Qtr3**	**QTR4**	**Qtr Total**	**Rate Amount**
Delhi	2020	2400	2100	3000	15	
Punjab	1100	1300	1500	1400	20	
U.P.	3000	3200	2600	2800	17	
Haryana	1800	2000	2200	2700	15	
Rajasthan	2100	2000	1800	2200	20	

TOTAL
AVERA
GE

a) Apply Formatting as follow:
   i. Title in TIMES NEW ROMAN
   ii. Font Size - 14
   iii. Remaining text - ARIAL, Font Size -10
   iv. State names and Qtr. Heading Bold, Italic with Gray Fill Color.
   v. Numbers in two decimal places.
   vi. Qtr. Heading in center Alignment.
   vii. Apply Border to whole data.

b) Calculate State and Qtr. Total

c) Calculate Average for each quarter

d) Calculate Amount = Rate * Total.

2. Given the following worksheet

	A	B	C	D
1	Roll No.	Name	Marks	Grade
2	1001	Sachin	99	
3	1002	Sehwag	65	
4	1003	Rahul	41	
5	1004	Sourav	89	
6	1005	Har Bhajan	56	

Calculate the grade of these students on the basis of following guidelines:

If Marks	Then Grade
>= 80	A+
>= 60 < 80	A
>= 50 < 60	B
< 50	F

3. Given the following worksheet:

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	A	B	C	D	E	F	G
1	**Salesman**		**Sales in (₹)**				
2	No.	Qtr1	Qtr2	Qtr3	Qtr4	Total	Commission
3	S001	5000	8500	12000	9000		
4	S002	7000	4000	7500	11000		
5	S003	4000	9000	6500	8200		
6	S004	5500	6900	4500	10500		
7	S005	7400	8500	9200	8300		
8	S006	5300	7600	9800	6100		

Calculate the commission earned by the salesmen on the basis of following Candidates:

If Total Sales	Commission
< 20000	0% of sales
> 20000 and < 25000	4% of sales

The total sales is sum of sales of all the four quarters.

4. A company XYZ Ltd. pays a monthly salary to its employees which consists of basic salary, allowances & deductions. The details of allowances and deductions are as follows: **Allowances**
   - HRA Dependent on Basic
     30% of Basic if Basic
     <=1000
     25% of Basic if Basic>1000 & Basic<=3000
     20% of Basic if Basic > 3000
   - DA Fixed for all employees, 30% of Basic
   - Conveyance Allowance
     ₹ 50/- if Basic is <= 1000
     ₹ 75/- if Basic > 1000 & Basic <= 2000
     ₹ 100 if Basic > 2000
   - Entertainment
     Allowance NIL if
     Basic is <= 1000
     ₹ 100/- if Basic > 1000

   Deductions
   - Provident Fund 6% of Basic
   - Group Insurance Premium
     ₹ 40/- if Basic is <= 1500
     ₹ 60/- if Basic > 1500 & Basic<=3000
     ₹ 80/- if Basic >

   3000 Calculate the

following:
Gross Salary = Basic + HRA + DA + Conveyance +
Entertainment Total Deduction = Provident Fund + Group
Insurance Premium Net Salary = Gross Salary – Total Deduction

5. Create Payment Table for a fixed Principal amount, variable rate of interests and time in the format below:

No. of Instalments	5%	6%	7%	8%	9%
3	XX	XX	XX	XX	XX
4	XX	XX	XX	XX	XX
5	XX	XX	XX	XX	XX
6	XX	XX	XX	XX	XX

6. Use an array formula to calculate Simple Interest for given principal amounts given the rate of Interest and time

Rate of Interest	8%
Time	5 Years
Principal	Simple Interest
1000	?
18000	?
5200	?

7. The following table gives year wise sale figure of five salesmen in ₹

Salesman	2000	2001	2002	2003
S1	10000	12000	20000	50000
S2	15000	18000	50000	60000
S3	20000	22000	70000	70000
S4	30000	30000	100000	80000
S5	40000	45000	125000	90000

a) Calculate total sale year wise.
b) Calculate the net sale made by each salesman
c) Calculate the maximum sale made by the salesman
d) Calculate the commission for each salesman under the condition.
   i. If total sales > 4,00,000 give 5% commission on total sale made by the salesman.
   ii. Otherwise give 2% commission.
e) Draw a bar graph representing the sale made by each salesman.
f) Draw a pie graph representing the sale made by salesman in 2000.

8. Enter the following data in Excel Sheet
PERSONAL BUDGET FOR FIRST
QUARTER Monthly Income (Net): 1,475

EXPENSES	JAN	FEB	MARCH	QUARTER TOTAL	QUARETER AVERAGE
Rent	600.00	600.00			

Telephone	48.25	43.50	60.00		
Utilities	67.27	110.00	70.00		
Credit Card	200.00	110.00	70.00		
Oil	100.00	150.00	90.00		
AV to Insurance	150.00				
Cable TV	40.75	40.75	40.75		
Monthly Total					

Calculate Quarter total and Quarter average.

a) Calculate Monthly total.
b) Surplus = Monthly income - Monthly total.
c) What would be total surplus if monthly income is 1500.
d) How much does telephone expense for March differ from quarter average.
e) Create a 3D column graph for telephone and utilities.
f) Create a pie chart for monthly expenses.

9. Enter the following data in Excel Sheet:

TOTAL REVENUE EARNED FOR SAM'S BOOKSTALL					
Publisher	**1997**	**1998**	**1999**	**2000**	**Total**
A	₹1,000.00	₹1100.00	₹1,300.00	₹800.00	
B	₹1,500.00	₹700.00	₹1,000.00	₹2,000.00	
C	₹700.00	₹900.00	₹1,500.00	₹600.00	
D	₹1,200.00	₹500.00	₹200.00	₹1,100.00	
E	₹800.00	₹1,000.00	₹3,000.00	₹560.00	

a) Compute the total revenue earned.
b) Plot the line chart to compare the revenue of all publisher for 4 years.
c) Chart Title should be Total Revenue of Sam's Bookstall (1997-2000)
d) Give appropriate categories and value axis title.

10. Generate 25 random numbers between 0 & 100 and find their sum, average and count. How many numbers are in range 50-60.

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Understand the basics of computer hardware and how software interacts with computer hardware and the concepts of addressing modes.	U(2)	PO1	PSO1 PSO2
CO2	Apply logic gates and Boolean expression using Boolean algebra.	Ap(3)	PO2	PSO3
CO3	Analyse and design combinational and sequential circuit.	An(4)	PO4	PSO4

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R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating

Reference Books:

1. Goel, Computer Fundamentals, Pearson Education, 2010.
2. P. Aksoy, L. DeNardis, Introduction to Information Technology, Cengage Learning, 2006
3. P. K.Sinha, P. Sinha, Fundamentals of Computers, BPB Publishers, 2007

Name of the course: **Introduction to Database System** → 100% modification
Course code: **UGCMSGE02**
Total Class Hours: **120** Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. Gain knowledge of database systems and database management systems software, formulate, using SQL, solutions to a broad range of query and data update problems.
2. Be acquainted with the basics of transaction processing and concurrency control and understand the database storage structures and access techniques.
3. Understanding of normalization theory and apply such knowledge to the normalization of a database.

SYLLABUS

A Theory (60 Hours) **4 Credit**

1. **Database** (14 L)
   Introduction to database, relational data model, DBMS architecture, data independence, DBA, database users, end users, front end tools
2. **E-R Modelling** (14 L)
   Entity types, entity set, attribute and key, relationships, relation types, E- R diagrams, database design using ER diagrams
3. **Relational Data Model** (14 L)
   Relational model concepts, relational constraints, primary and foreign key, normalization: 1NF, 2NF, 3NF
4. **Structured Query Language** (18 L)
   SQL queries, create a database table, create relationships between database tables, modify and manage tables, queries, forms, reports, modify, filter and view data

B Practical (60 Hours) **2 Credit**

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)

a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
b) Delete the record of book titled 'Database System Concepts'.
c) Change the Department of the book titled 'Discrete Maths' to 'CS'.
d) List all books that belong to 'CS' department.
e) List all books that belong to 'CS' department and are written by author 'Navathe'.
f) List all books for Department='CS' that have been issued.
g) 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).

a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
b) 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.
c) List all students who live in —Delhi and have marks greater than 60 in paper 1.
d) Find the total attendance and total marks obtained by each student.
e) 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)

a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
b) List all the customers who have the bicycles manufactured by manufacturer —Honda.
c) List the bicycles purchased by the customers who have been referred by customer —C1.
d) List the manufacturer of red colored bicycles.
e) 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)

   a) Identify primary and foreign keys.
   b) Alter table employee, add a column —email of type varchar(20).
   c) Find the name of all managers who work for both Samba Bank and NCB Bank.
   d) 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.
   e) Find the names of all employees who live in the same city as the company for which they work.
   f) Find the highest salary, lowest salary and average salary paid by each company.
   g) Find the sum of salary and number of employees in each company.
   h) 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)

   a) Identify primary and foreign keys.
   b) Get supplier numbers for suppliers in Paris with status>20.
   c) Get suppliers details for suppliers who supply part P2. Display the supplier list in increasing order of supplier numbers.
   d) Get suppliers names for suppliers who do not supply part P2.
   e) For each shipment get full shipment details, including total shipment weights.
   f) Get all the shipments where the quantity is in the range 300 to 750 inclusive.
   g) Get part nos. for parts that either weigh more than 16 pounds or are supplied by suppliers S2, or both.
   h) Get the names of cities that store more than five red parts.
   i) Get full details of parts supplied by a supplier in London.
   j) Get part numbers for part supplied by a supplier in London to a project in London.
   k) Get the total number of project supplied by a supplier (say, S1).
   l) Get the total quantity of a part (say, P1) supplied by a supplier (say, S1).

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Ability to define the database systems and database management systems software, formulate, using SQL, solutions to a broad range of query and data update problems	R(1)	PO1	PSO1

CO2	Ability to understand the basics of transaction processing and concurrency control and understand the database storage structures and access techniques.	U(2)	PO2	PSO1 PSO2
CO3	Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.	Ap(3)	PO3	PSO2
CO4	Compare, contrast and analyse the various emerging technologies for database systems.	An(4)	PO4	PSO3 PSO4
CO5	Analyse strengths and weaknesses of the applications of database technologies to various subject areas.	E(5)	PO4	PSO4
CO6	Ability to model data in applications using conceptual modelling tools such as ER Diagrams and design data base schemas based on the model.	C(6)	PO6	PSO6

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating

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

Name of the course: **Programming Fundamentals using C/C++** → 100% modification
Course code: **UGCMSGE03**
Total Class Hours: **120** Credit **4+2 (Theory & Lab)**

Course Objectives:

1. Knowledge and capability to find computational solution of different problems.
2. Capability to construct algorithm of problems.
3. Understanding the C/C++ programming language.
4. Knowledge of basic programming aspects such as loop, function, array, structure, class, objects, etc.

SYLLABUS

A Theory (60 Hours) **4 Credit**

1. **Introduction to C and C++** (5 L)
   History of C and C++, Overview of Procedural Programming and Object-Orientation Programming, Using main() function, Compiling and Executing Simple Programs in C++.
2. **Data Types, Variables, Constants, Operators and Basic I/O** (10 L)
   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, putchar etc), Formatted and Console I/O ((printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h, conio.hetc).

3. **Expressions, Conditional Statements and Iterative Statements** (10 L)
   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)
4. **Functions and Arrays** (10 L)
   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
5. **Derived Data Types (Structures and Unions)** (5 L)
   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.
6. **File I/O, Preprocessor Directives** (10 L)
   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
7. **Using Classes in C++** (10 L)
   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

B Practical (60 Hours) **2 Credit**

1. Write a program to find greatest of three numbers.
2. Write a program to find gross salary of a person.
3. Write a program to find grade of a student given his marks.
4. Write a program to find divisor or factorial of a given number.
5. Write a program to print first ten natural numbers.
6. Write a program to print first ten even and odd numbers.

7. Write a program to find grade of a list of students given their marks.
8. Create Matrix class. Write a menu-driven program to perform following Matrix operations (2-D array implementation):
   a) Sum b) Difference c) Product d) Transpose
9. Using for loop, print a table of Celsius/Fahrenheit equivalences. Let c be the Celsius temperatures ranging from 0 to 100, for each value of c, print the corresponding Fahrenheit temperature.
10. Write a function that takes an integer input and calculates the factorial of that number.

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Discuss, memorize and understand the different concept of C/C++ programming constructs and classes for code reuse.	R(1), U(2)	PO2	PSO1
CO2	Solve problems and propose algorithms, pseudo codes and flowcharts for it.	Ap(3), C(6)	PO6	PSO5 PSO6
CO3	Identify real life problems and convert it to computational problems.	Ap(3)	PO3	PSO2 PSO3
CO4	Apply the concepts of structural and object oriented programming such as loops, functions, structure, class, inheritance, friend functions, and virtual functions to develop programs for problem solving.	Ap(3), C(6)	PO3	PSO3
CO5	Analyse and Compare approaches to model efficient and standard programs.	An(4)	PO4 PO5	PSO4
CO6	Evaluate, design, compile, run and debug programs for software development.	E(5)	PO4 PO5	PSO5 PSO6

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating

Reference Books:

1. HerbtzSchildt, "C++: The Complete Reference", Fourth Edition, McGraw Hill.2003
2. BjarneStroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley, 2013.
3. BjarneStroustroup, "Programming -- Principles and Practice using C++", 2nd Edition, Addison-Wesley 2014.
4. E Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill Education, 2008.

Name of the course: **Programming in Python** → 100% modification
Course code: **UGCMSGE04**

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Total Class Hours: **120**	Credit: **4+2 (Theory & Lab)**

Course Objectives:

1. Knowledge of different concept of Python programming such as classes, code reusability, loops, functions, inheritance, recursion, list, tuple, etc.
2. Capability to design and reuse codes with the aid of object oriented programming.
3. Capability to develop real life problem solving applications.

SYLLABUS

A Theory (60 Hours)

1. **Planning the Computer Program:** (4L)
   Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.
2. **Techniques of Problem Solving:** (6L)
   Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.
3. **Overview of Programming:** (4L)
   Structure of a Python Program, Elements of Python
4. **Introduction to Python:** (6L)
   Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator)
5. **Creating Python Programs:** (8L)
   Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments, Errors and Exceptions.
6. **Iteration and Recursion:** (8L)
   Conditional execution, Alternative execution, Nested conditionals, The return statement, Recursion, Stack diagrams for recursive functions, Multiple assignment, The while statement, Tables, Two-dimensional tables
7. **Strings and Lists:** (10L)
   String as a compound data type, Length, Traversal and the for loop, String slices, String comparison, A find function, Looping and counting, List values, Accessing elements, List length, List membership, Lists and for loops, List operations, List deletion. Cloning lists, Nested lists
8. **Object Oriented Programming:** (4L)
   Introduction to Classes, Objects and Methods, Standard Libraries.
9. **Data Structures:** (4L)
   Arrays, list, set, stacks and queues.

10. **Searching and Sorting:** (6L)
    Linear and Binary Search, Bubble, Selection and Insertion sorting.

B Practical (60 Hours)

1. Using for loop, print a table of Celsius/Fahrenheit equivalences. Let c be the Celsius temperatures ranging from 0 to 100, for each value of c, print the corresponding Fahrenheit temperature.
2. Using while loop, produce a table of sins, cosines and tangents. Make a variable x in range from 0 to 10 in steps of 0.2. For each value of x, print the value of sin(x), cos(x) and tan(x).
3. Write a program that reads an integer value and prints —leap year or —not a leap year.
4. Write a program to find grade of a list of students given their marks.
5. Write a program to find divisor or factorial of a given number.
6. Write a program to print first ten natural numbers.
7. Write a program to find gross salary of a person.
8. Write a program that takes a positive integer n and then produces n lines of output shown as follows. For example, enter a size: 5
   *
   **
   ***
   ****
   *****
9. Write a function that takes an integer n as input and calculates the value of 1 + 1/1! + 1/2! + 1/3! + … + 1/n
10. Write a function that takes an integer input and calculates the factorial of that number.
11. Write a function that takes a string input and checks if it's a palindrome or not.
12. Write a list function to convert a string into a list, as in list ('abc') gives [a, b, c].
13. Write a program to generate Fibonacci series.
14. Write a program to check whether the input number is even or odd.
15. Write a program to compare three numbers and print the largest one.
16. Write a program to print factors of a given number.
17. Write a method to calculate GCD of two numbers.
18. Write a program to create Stack Class and implement all its methods. (Use Lists).
19. Write a program to create Queue Class and implement all its methods. (Use Lists)
20. Write a program to implement linear and binary search on lists.
21. Write a program to sort a list using insertion sort and bubble sort and selection sort.

Course Outcomes

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO1	Define algorithms and to draw flowcharts for program writing.	R(1)	PO1	PSO1

CO2	Ability to show the installation and running of the Python interpreter	U(2)	PO1	PSO2
CO3	Understand the Numbers, Math functions, Strings, List, Tuples, Dictionaries and operators in Python	U(2)	PO2	PSO2
CO4	Understand and summarize different File handling operations and packages	U(2)	PO2	PSO2
CO5	Apply different decision making statements and loops, different functions and modules	Ap(3)	PO3	PSO4
CO6	Design programs using Python for problem solving	C(6)	PO5	PSO5

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating

Reference Books:

1. T. Budd, Exploring Python, TMH, 1st Ed, 2011
2. How to think like a computer scientist: learning with Python / Allen Downey, Jeffrey Elkner, Chris Meyers 1st Edition – Freely available online. 2012
3. http://docs.python.org/3/tutorial/index.html
4. http://interactivepython.org/courselib/static/pythonds

Ability Enhancement Compulsory Course — Credit: 2

Name of the course: **English Communication** → 100% modification
Course code: **UGCMSAECC01**
Total Class Hours: **30** Credit: **2**

Course Objectives:

1. Students will have the capability to read, write and communicate fluently in English.
2. Students will have the capability to distinguish more important ideas from less important ones.

SYLLABUS

A Theory **2 Credits**

1. **Introduction to Communication** (5 L)
   Process of Communication, Levels of Communication, Flow of Communication, Verbal and Non-Verbal Communication, Barriers to Communication
2. **Listening and Speaking Skills** (10 L)
   Listening and its types, Barriers to effective listening, Trials of a good listener, Introduction to English Phonetic Symbols: Consonants and Vowels with illustrations in use, Dialogue, Group Discussion, Presentation, Interview Technique.
3. **Reading and Writing Skills** (15 L)
   Techniques of Reading, Types of Reading, Reading Comprehension (unseen passage), Paragraph Writing, Letter Writing, Email Writing, Report Writing, Proposal writing, Book Review, Poster Making

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO 1	Recall English Phonetic Symbols and demonstrate their use with emphasis on various scientific terms.	R(1) U(2)	PO2	PSO1
CO 2	Utilize various processes of communication	Ap(3)	PO2	PSO2
CO 3	Compare and analyze dialogue, group discussion, presentation, interview techniques	An(4)	PO5	PSO2

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CO 4	Judge different techniques of reading and writing skills.	E(5)	PO5 PO6	PSO3
CO 5	Develop the skill to create original write up in the form of report, proposal, paragraph, review etc.	C(6)	PO4 PO5	PSO5

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating

Reference Books:

1. Vibrant English (New Delhi: Orient Black Swan)
2. Speak Well (New Delhi: Orient Black Swan) a compulsory supplementary Work Book for exercises on Interactions, dialogue, presentation skills, Group discussions, debates and Interviews.

Recommended Readings for advanced learning:

1. Advanced Skills in English. eds E Suresh Kumar et al..
2. Practising Writing Skills, Work Book
3. Enhancing English and Employability Skills
4. Business Communication,
5. English for Fluency
6. English Language Practice
7. Basics of Academic English- 1 and 2
8. Practising English- all these are Orient Black Swan publications

Name of the course: **Environmental Science** → 100% modification
Course code: **UGCMSAECC02**
Total Class Hours: **60** Credit: **2**

Course Objectives:

1. Remembers and understands the concept, components and function of natural resources and ecosystems.
2. Understand and evaluate the Cause, effects and control measures of various environmental pollutants.
3. Understand the basic idea about the disasters and its management.
4. Understand and apply the knowledge about the social, environmental issues and environmental legislation.

SYLLABUS

A Theory (60 Hours) **2 Credits**

1. **Definition** (2 L)

Scope and importance. Need for public awareness.

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2. **Natural Resources: Renewable and non-renewable** (8 L)

   Forest, Water, Mineral, Food, Energy & Land resources – Use and associated problems.

3. **Ecosystems** (12 L)

   Concept, Structure and function, Energy flow, Ecological succession, Food chains, food webs and ecological pyramids. Types – Forest, Grassland, Desert & Aquatic (ponds, streams, lakes, rivers, oceans, estuaries) ecosystems.

4. **Environmental Pollution** (10 L)

   Definition, Cause, effects and control measures of - Air, Water, Soil, Noise pollution and Nuclear hazards. Solid waste Management. Role of an individual in prevention of pollution.

5. **Disasters and management** (4 L)

   Floods, Earthquake, Cyclone and Landslides.

6. **Social Issues and the Environment** (10 L)

   Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation. Consumerism and waste products. Urban problems related to energy.

7. **Environmental legislation** (8 L)

   Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

8. **Human Population and the Environment** (6 L)

   Population growth, variation among nations; Population explosion – Family Welfare Programme; Environment and human health (including HIV/AIDS); Human Rights; Role of Information Technology in Environment and human health.

Course Outcomes:

CO No.	Course Outcomes:	Cognitive Level	PO Addressed	PSO Addressed
CO 1:	Define and demonstrate the concept, components and function of natural resources and ecosystems.	R(1) U(2)	PO1	PSO1
CO 2:	Define, illustrate and analyse the cause, effects and control measures of various environmental pollutants.	R(1) U(2) An(4)	PO 3	PSO1
CO 3:	Demonstrate the basic idea about the disasters and its management..	U(2)	PO 3	PSO2
CO 4:	Illustrate and apply the knowledge about the social, environmental issues and environmental legislation.	U(2)	PO 4	PSO3

		Ap(3)		PSO4
CO 5:	Define, demonstrate and evaluate the impact of human population on the Environment	R(1) U(2) E(5)	PO 6	PSO5

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References:

1. Agarwal KC, 2001. Environmental Biology, Nidi Publishers Ltd. Bikaner.
1. Bharucha Erach, 2003. The Biodiversity of India, Mapin Publishing Pvt. Ltd, Ahmedabad – 380013, India. Email: mapin@icenet.net
2. Brunner RC, 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480pgs.
3. Clark RS, Marine Pollution, Clanderson Press, Oxofrd (TB).
4. Cunningham WP, Cooper TH, Gorhani E & Hepworth MT, 2001. Environmental Encyclopaedia, Jaico Publishing House, Mumbai, 1196pgs.
5. De AK, Environmental Chemistry, Wiley Eastern Ltd.
6. Down to Earth, Center for Science and Environment (R)
7. Gleick HP, 1993. Water in Crisis, Pacific Institute for Studies in Development, Environment and Security. Stockholm Environmental Institute, Oxford University Press, 473pgs.
8. Hawkins RE, Encyclopaedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
9. Heywood V H and Watson R T, 1995. Global Biodiversity Assessment. Cambridge University Press 1140pgs.
10. Jadhav H and Bhosale VM, 1995. Environmental Protection and Laws. Himalaya Publishing House, Delhi 284pgs.
11. Mckinney ML and Schoch RM, 1996. Environmental Science Systems and Solutions. Web enhanced edition, 639pgs.
12. Mhaskar AK, Matter Hazardous, Techno-Science Publications (TB)
13. Miller TG, Jr. Environmental Science, Wadsworth Publishing CO. (TB)
14. Odum EP, 1971. Fundamentals of Ecology. WB Saunders Co. USA, 574pgs.
15. Rao MN and Datta AK, 1987. Waste Water Treatment. Oxford and IBH Publishing Co. Pvt. Ltd. 345pgs.

Skill Enhancement Course — Credit: 2

Name of the course: **Value Education and Indian Culture** → 100% modification
Course code: **UGCMSAECC02**
Total Class Hours: **60** Credit: **2**

Course Objectives:

1. Attain awareness about daily routine, self-evaluation & Integral Personality Development
2. Understand the educational needs, the Power of thoughts and the Science of Peace
3. Understand the relation: Values and enlightened citizenship
4. Attain awareness about the Indian Practice and Culture
5. Demonstrate the importance of Four Yogas
6. Acquire idea about Modern India: her hopes, challenges and Swami Vivekananda

SYLLABUS

A Theory (60 Hours) **2 Credits**

1. **Daily Routine** (6 L)

   A suggested daily routine, The daily routine & the concept of Biological clock: key to a healthy and productive life, Necessity for an all-round daily routine, Combining Rest and Activity, Hardships and Joy in a daily routine, The scope of developing the power of concentration and detachment through a daily routine, Daily Routine disciplines the system but confers conviction on oneself.

2. **Self-Evaluation & Integral Personality Development** (8 L)

   Why is Self-Evaluation important? Because if you win yourself, you win the world, Quantitative Self Evaluation for a qualitative change: A method, Traits to track Personality Development: Academic Excellence, Social Compatibility, Participation in Group events, Sense of Responsibility, Role as a Consumer, Scientific Temperament, Aesthetic taste and creativity, Leisure time Activities, Concern for others, Spiritual values, Close and Constant Self Evaluation : a stitch in time saves nine, The world *is* as we *are* : A minor inner change may nullify a major outer perturbation.

3. **Our Educational Needs** (8 L)

   The need of a correct blend of inner and outer well-being in education, Man-making, Character building education : growing from within , a surer foundation of progress, The outer crust and the inner core of our personality: "What you are shouts so loudly in my ears that I cannot hear what you

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say.", A 5-point training in Discipline, Cleanliness, Behaviour, Manners and Ambition, Sharpening the sword of will: controlling its expression, a basic educational need, How to study effectively?

4. **The Power of thoughts and the Science of Peace** (5 L)

   Shanti Mantras: Peace can be radiated from and reflected back upon ourselves, You can create an ambience and others can enjoy it, can be benefitted by it, How to create a positive, peaceful and inspiring ambience?- the aggressive exertion and the unquestioning sacrifice involved in it.

5. **Subhashita: The Well said** (4 L)

   Bringing home high thoughts in nuggets of wisdom, Pearls of Wisdom and flames of fire: simple parables and anecdotes from the great ones.

6. **Values and Enlightened Citizenship** (4 L)

   Intrinsic and Instrumental Values, What makes a man great? A powerful will to do good born out of self-control and self-sacrifice, Learning the art of inter-personal relations: Not I but You, The combination of the Head, Heart and Hand: a valuable value for Enlightened Citizenship

7. **Unit7: Indian Practice and Culture** (5 L)

   The idea of sacredness & its necessity, Every aspect of life is sacred in India, Renunciation and service the twin ideals for India, My freedom from Nature helps me to serve nature and the world better, I never say I am the body, I always say this body is mine : I as a master of the body-mind complex, Weakness is death: in search of real strength of self-knowledge, reliance on God and unselfish service, Meditation, Concentration and the silent Indian path for becoming a dynamo of power, The Indian concept of Unity in diversity: Harmony of Religions

8. **Four Yogas** (6 L)

   The Real and Apparent Man, the science of knowing myself: Jnana Yoga, Taming the mighty current of emotions and giving them their right food: Bhakti Yoga, The Science of working wisely: Karma Yoga, The Process of making my mind mine: Raja Yoga, Selected portions from Swami Vivekananda's Karma Yoga, Harmony of 4 Yogas: a needed balance for the modern man

9. **Modern India: her hopes, challenges and Swami Vivekananda** (6 L)

   Swami Vivekananda's method of combining the best of the East & the West: where Indian values and Western workmanship join hands, Invigorating rationality in the field of the Indian search for the supreme joy : erasing the misconception of dogmatism, Rousing a sense of pride in the age-long Indian discoveries in the field of inner truths as opposed to an inferiority complex posed by Western material supremacy, Do you feel: Service, Swami Vivekananda's acid test for modern science and traditional spirituality.

10. **Students' Presentations/Project: (may be in groups)** (8 L)

    Project on Service, Teaching and Cleanliness

Course Outcomes:

CO No.	Course Outcomes	Cognitive Level	PO Addressed	PSO Addressed
CO 1:	Define, demonstrate and apply the daily routine, self-evaluation & Integral Personality Development	R(1), U(2), Ap(3)	PO1	PSO1
CO 2:	Demonstrate, and apply the Power of thoughts & the Science of Peace	U, Ap	PO 3	PSO2 PSO3
CO 3:	Demonstrate the relation between Values and enlightened citizenship	U	PO 3	PSO5
CO 4:	Discuss the awareness about the Indian Practice and Culture	C	PO 4	PSO3
CO 5:	Demonstrate and practice the Four Yogas	U, Ap	PO 6	PSO2
CO 6:	Explain and analyse the idea about Modern India: her hopes, challenges and Swami Vivekananda	U, An	PO 4, 6	PSO4

R= remembering, U = understanding, Ap = applying, An = analysing, E = evaluating, and C = creating

Reference Books

1. Jiivan Sopan, Published by Ramakrishna Mission Vivekananda Centenary College, Rahara, Kolkata
2. Swami Vivekananda : His Call to the Nation, Advaita Ashrama
3. Thoughts of Power: Swami Vivekananda, Advaita Ashrama
4. Swami Vivekananda, The Friend of all, Ramakrishna Mission Institute of Culture,Golpark, Kolkata
5. Gems, Ramakrishna Mission Institute of Culture, Golpark, Kolkata

Question Paper Pattern:

COMPONENT	NATURE OF THE QUESTION	MAXIMUM MARKS
Part A	Short answers	5 x 1 = 5 Marks
Part B	Listening	1 X 5 = 5 Marks
Part C	Speaking (Presentation and Project submission)	1 X 15 = 15 Marks
Part C	Reading Comprehension	1 x 5 = 5 Marks
Part C	Writing	2 x 5 = 10 Marks 1 x 10 = 10 Marks

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