REVISED COURSE CURRICULUM FOR

(4th) FOURTH SEMESTER

(COMPUTER ENGINEERING)

W.E.F. 2023-24

BOARD OF TECHNICAL EDUCATION

MUNI MAYA RAM
MARG PITAMPURA,
DELHI-110034

Scheme For
Fourth Semester : Computer Engineering

S. No.	Course Code	Course Title	Hours Per Week			Internal Marks	External Marks (3 Hours)	Credits
			L	T	P			
1	23COPC202	Programming in Python	3	0	0	50	100	3
2	23COPC204	Web Technologies	2	0	0	50	100	2
3	23COPC206	Data Structure in C	3	0	0	50	100	3
4	23COPC208	Microprocessor	3	0	0	50	100	3
5	23COPC210	Software Engineering	2	0	0	50	100	2
6	23AU250	Essence of Indian Knowledge and Tradition	1	0	0	50	-	1
7	23COPC252	Programming in Python Lab	0	0	4	50	50	2
8	23COPC254	Web Technologies Lab	0	0	4	50	50	2
9	23COPC256	Computer Hardware Maintenance & Troubleshooting Lab	0	0	4	50	50	2
		Total				450	650	20

Summer Internship II: After Fourth Semester, Student shall undergo Summer Internship of 4-6 Weeks which credit will be evaluated in Fifth Semester

Fourth Semester/Second Year

Course Code	23COPC202
Course Title	Programming in Python
Credits	Total: 3 (Theory - 3), L:3 T:0 P:0
Semester	IV (Computer Engineering)
Course Category	Mandatory

Course Objective:
Students Should be able to Design a solution to the problem using an Algorithm, Flowchart, and Pseudocode; Use python programming constructs, arrays, strings, functions, and modules to solve real-world problems;

Unit 1	Problem Solving and Program Design	
	Problem Solving and Program Design: Problem Solving and Introduction to Programming: Activities involved in Problem Solving, Programming Language, Classification of Programming Languages, Common programming errors. Program Design: Algorithm, Flowchart, Pseudocode: Introduction, Steps involved and detailed construction, Problems on selection, looping, flow chart analysis.	
Unit 2	Introduction to Python	
	Introduction to Python: Features of Python, Structure of Python Program, Interactive Execution, Installation and working on Python IDE: Jupyter/PyCharm/IntelliJ IDEA and others, Identifiers, Keywords, Delimiters and Literals, Statements, Variables, Escape Sequences; Comments, Data Types, Type Conversion Functions and Rounding, Operators: Arithmetic, Assignment, Unary Minus, Relational, Logical, Boolean, Bitwise, Membership: in, not in, Identity: is, is not; Expressions, Operator Precedence and Associativity, Input and Output Statements, Command Line Arguments, Short-circuit, and Lazy Evaluation. Control Flow Statements: Conditionals: if Statement, if-else Statement, Conditional Expressions; Nested Conditionals: Nested if and Multi-Way if-elif-else Statements; Looping: while statement, for statement, else suite, The range() Function; Nested loops; The break statement; The continue Statement; The pass Statement; The assert statement; The return Statement.	
Unit 3	Functions and Modules	
	Functions: Built-in, User-Defined and Anonymous function; Elements of User-Defined Functions, Arguments and Return Values, Formal vs. Actual Arguments, Scope and Lifetime, Positional, Keyword Arguments & Default Arguments, Nested Functions, Using Lambdas with filter(), map() and reduce() function, Decorators, Iterators, Generators, Recursion. Modules: Importing Modules; Math, Random and other standard library modules, Packages, Custom Modules.	

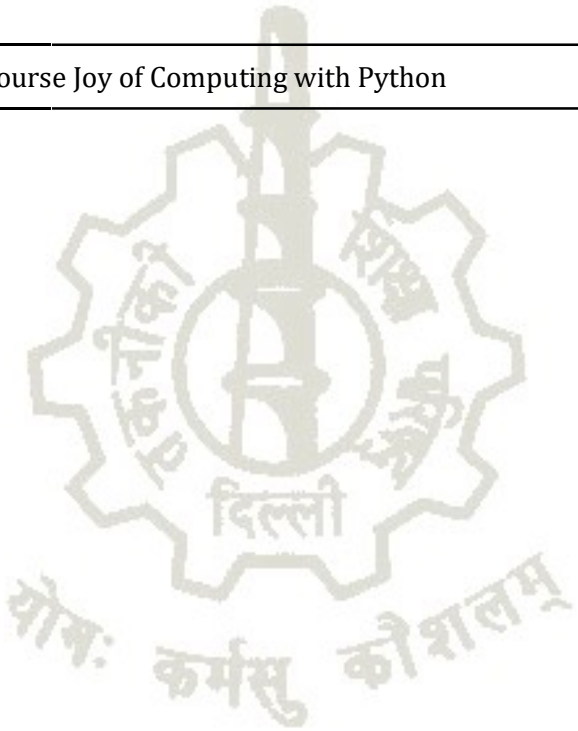
Unit 4	Built In Data Structures	
	Built-in Primitive Data Structures; Arrays: Single dimensional, Multi-dimensional arrays (up to three dimensions), Array Creation using an array, linspace, logspace, arrange, zeros, ones, Operations on Arrays. Strings: Basics, Immutability, String creation, String Indexing and Slicing, String Manipulation, The subscript operator, Searching substrings.	
Unit 5	File Handling and Advanced Python	
	File Handling: Text and Binary Files - Writing and Reading Operations, Random Access to Files, The with Statement, Pickle in Python, Manipulating Files and Directories, Closing Files. Introduction to Object-Oriented Programming: Features, Classes & Objects, Immutable vs. Mutable Objects, Access Modifiers, Attributes and methods, Data Hiding, The 'self' variable, Constructor, Instance Variables and Class or Static Variables, Inner Classes, Passing members of one Class to another Class. Exception Handling: Error, Exception: Preliminaries and Exception Class Hierarchy, Handling Exception using try, except and finally clauses, Raising Exceptions, Assertions, User-Defined Exceptions, Exception logging. Introduction to Python Libraries like Pandas, NumPy, Matplotlib; Polars and others	

Course Outcome:
1. Design a solution to the problem using an Algorithm, Flowchart, and Pseudocode. 2. Use python programming constructs, arrays, strings, functions, and modules to solve real-world problems. 3. Design & develop custom functions & modules. 4. Apply data structure primitives like lists, tuples, sets, and dictionaries. 5. Apply file management operations to operate on files. 6. Design and develop object-oriented solutions to problems using python programming language. 7. Familiarize and apply basic data science operations using Numpy, Pandas and Matplotlib library.

Text Books
1. Concepts Of Programming Languages, Sebesta, Pearson Addison Wesley. 2. Programming languages: Design and implementation, Terrance W. Pratt, Marvin V. Zelkowitz, T.V. Gopal 3. The Art of Programming Through Flowcharts & Algorithms, Anil Bikas Chaudhuri. 4. Python Programming: Using Problem Solving Approach; By Reema Thareja; Oxford University Press; 5. Programming And Problem Solving With Python By Ashok Namdev Kamthane & Amit Ashok Kamthane; McGraw Hill Education (India) Private Limited

Reference Books:
1. Beginning Python From Novice to Professional, Magnus Lie Hetland, Apress 2. Python for Data Analysis, Wes McKinney, O'Reilly Media, Incorporated 3. Python Data Analytics With Pandas, NumPy, and Matplotlib, Fabio Nelli, Apress 4. Exploring Python, Timothy A. Budd, McGraw-Hill Education 5. Learning Python, Mark Lutz, O'Reilly Media, Inc. 6. Introduction to Programming Using Python, Liang Y. Daniel, Pearson Education 7. Programming in Python 3: A Complete Introduction to the Python Language, Mark Summerfield; Pearson Addison-Wesley Professional. 8. Core Python Programming, R. Nageswara Rao, Dreamtech Press

Online Resources:
1. Swayam/NPTEL Course Joy of Computing with Python



Course Code	23COPC204
Course Title	Web Technologies
Credits	Total: 2 (Theory - 2), L:2 T:0 P:0
Semester	IV (Computer Engineering)
Course Category	Mandatory

Course Objective:
● To know the principles of web design ● To understand designing of the web sites ● To impart knowledge of building dynamic web pages and develop interactive web applications

Unit 1	World Wide Web & HTML	
	Introduction, Web page, Home page, Web site, Static and Dynamic website, Client-Server Computing concepts, Web Client and Web Server, Web Browser, Client-side and Server-side Scripting Languages Basics of HTML, HTML comments, formatting and fonts, colour, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Overview and features of the latest version of HTML	
Unit 2	Cascading Style Sheets	
	Introduction to CSS, Basic syntax and structure, Use of CSS in setting background images, colours and properties, manipulating texts, fonts, borders and boxes, margins, padding lists, and positioning tables, images, text etc.	
Unit 3	Java Script	
	Introduction to JavaScript, Basic Syntax and Structure, Data types, Control statements, Operators, Dialog boxes, Built-in and user defined functions, Objects in JavaScript, Handling Events, Basic validations, Document Object Model, Browser Object Model	
Unit 4	XML	
	Introduction, Features, Naming rules, uses of XML, Building block of XML Document, Difference between HTML and XML, XML Parser, DTD using XML with HTML and CSS	
Unit 5	PHP and MySQL	
	Introduction and basic syntax of PHP, Decision and Looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Form Data Handling with PHP, Database connectivity and handling using PHP-MySQL	

Course Outcome:
At the end of the course the students will be able to: ● Understand the fundamentals of the Internet and Principles of web design ● Realize the potential of designing websites ● Design dynamic web pages with different technologies ● Familiarize with modern interactive web applications

Text Books
Bayross, I. (2013). Web enabled commercial application development using HTML, JavaScript, DHTML and PHP. 4th edition. BPB Publication.

Reference Books:
1. Thomas A. Powell, HTML & CSS: The Complete Reference, 5th edition, McGraw Hill 2. Ralph Moseley and M. T. Savaliya, Developing Web Applications, Wiley-India Private Limited, 2011. 3. Robert W.Sebesta, Programming the World Wide Web, 7th edition, Pearson Education, 2013.

Online Resources:
w3schools

Course Code	23COPC206
Course Title	Data Structure in C
Credits	Total: 3 (Theory - 3), L:3 T:0 P:0
Semester	IV (Computer Engineering)
Course Category	Mandatory

Course Objective:
To provide a strong foundation for implementing programming language to formulate, analyse and develop solutions related to various data structures problems.

Unit 1	Introduction to Data Structures: Basic Terminology, Classification of Data Structures, Operations on Data Structures.	
Unit 2	Linear Data Structures- Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on a Stack, Applications of Stacks-Infix-to-Postfix Transformation, evaluating Postfix Expressions.	
Unit 3	Queues: Introduction to Queues, Array Representation of Queues, Operations on a Queue, Types of Queues-DeQueue, Circular Queue, Applications of Queues-Round Robin Algorithm.	
Unit 4	Linked Lists: Singly Linked List, Representation in Memory, Operations on a Single Linked List, Circular Linked Lists, Doubly Linked Lists, Linked List Representation and Operations of Stack, Linked List Representation and Operations of Queue.	

Course Outcome:

- Have a good understanding of Data Structures and its applications in algorithms.

Text Books

1. Data Structures, R.S. Salaria, Khanna Book Publishing, New Delhi
2. Data Structures Using C, Reema Thareja, Oxford University Press India.
3. Classic Data Structures, Samanta Debasis, Prentice Hall of India.
4. Fundamentals of Data Structure in C, Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, University Press, India.

Reference Books:
1. Data Structures: A Pseudocode approach with C, Richard F. Gilberg, Behrouz A. Forouzan, CENGAGE Learning, India. 2. Data Structures and Algorithms: Concepts, Techniques and Applications, G. A. V. Pai, McGraw- Hill Education, India.

Online Resources:
geeksforgeeks.org, javatpoint.com

Course Code	23COPC208
Course Title	Microprocessor
Credits	Total: 3 (Theory - 3), L:3 T:0 P:0
Semester	IV (Computer Engineering)
Course Category	Mandatory

Course Objective:
● To understand the Architecture and instruction set of 8-bit microprocessor computer systems ● To provide the basic knowledge of Assembly Language programming using 8085 kit / Macro Assembler ● To introduce students with the programmable support chips used in Microprocessor-based system and their applications

Unit 1	Architecture of 8085 Microprocessor, Functions of ALU, Timing and Control Unit, Functional Pins and Registers Organization, Bus and its types, 8085 Instruction Cycle, Machine Cycle and State Timing Diagram - opcode fetch cycle, Memory read and write operation. Memory organisation and interfacing, Memory map, Address decoding and Memory address	
Unit 2	Instruction Set, Instruction classification, Addressing modes,Data transfer instructions, Arithmetic instructions, Logic,instructions, Branch instructions, Stack instructions, Machine control instructions	
Unit 3	Looping, Counting, Indexing, Sorting, Use of counters and time delays, Use of stack and subroutines	
Unit 4	Interrupt Handling, Interrupts of 8085, Priority of interrupts, Restart instructions, Interrupts: Software and Hardware,Enabling, Disabling and Masking of interrupts	
Unit 5	Basic interfacing concepts, Memory mapped I/O, I/O mapped I/O, I/O Operations, Programmed I/O, Interrupt driven I/O, Synchronous and Asynchronous data transfer, Microprocessor-controlled data transfer and Peripheral controlled data transfer	
Unit 6	8255 Programmable Peripheral Interface, 8253/8254 Programmable Timer, 8279 Programmable keyboard / Display interface, 8257 DMA controller, 8259/8259A Programmable Interrupt Controller	

Course Outcome:
On completion of the course, student will be able to: ● Explain the basic of 8085 Microprocessor and its Architecture ● Get familiarity with 8085 instruction set and instruction execution ● Apply logic for various given problem and develop programs using Assembly Language instruction set ● Understand the concept of Computer Interrupts and their handling

Text Books
1. Ramesh S. Gaonkar, "Microprocessor, Architecture, Programming, and Applications with the 8085", Penram International Publication, 5/e 2.Microprocessor Architecture,Programming and applications with the 8085 Ramesh Gaonkar

Reference Books:
1.Fundamentals of Microprocessor and Microcomputer B.Ram

Online Resources:
tutorialspoint.com,geeksforgeeks.org

Course Code	23COPC210
Course Title	Software Engineering
Credits	Total: 2 (Theory - 2), L:2 T:0 P:0
Semester	IV (Computer Engineering)
Course Category	Mandatory

Course Objective:
The accelerated expansion of computing technologies and applications into all our lives means students need to understand the principles of computer science now, more than at any other time. It is necessary for all students to understand the ethical and social role of computer applications in society.

Unit 1	Introduction: Software Crisis, Software Processes & Characteristics, Software life cycle models, Waterfall, Prototype, Evolutionary and Spiral Models Software Requirements analysis & specifications: Requirement engineering, requirement elicitation techniques like FAST, QFD, Requirements analysis using DFD(with case studies), Data dictionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organisation of SRS.	
Unit 2	Software Project Management Concepts: The Management spectrum, Key Objectives of Effective Management Software Project Planning: Size Estimation like lines of Code & Function Count, Cost Estimation Models, COCOMO, Risk Management.	
Unit 3	Software Design: Cohesion & Coupling, Classification of Cohesiveness & Coupling, Layered arrangement of modules, Function Oriented Design, Object Oriented Design Software Metrics: Software measurements: What & Why, Token Count, Halstead Software Science Measures, Design Metrics, Data Structure Metrics.	
Unit 4	Software Testing: Code Review, Testing Process, Types of Testing, Functional Testing, Structural Testing, Test Activities, Unit Testing, Integration Testing and System Testing(Performance Testing and Error Seeding), Debugging Activities. Software Reliability: Failure and Faults, Reliability Models: Basic Model Software Quality Standards SEI & CMM Software Maintenance: Management of Maintenance, Maintenance Process, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation	

Course Outcome:
After studying this course, students will be able to: 1. To understand the iterative implementation of software projects. 2. To analyze projects using use case modelling tools. 3. To develop solutions for real-life cases using design models and patterns. 4. To understand and implement project design requirements for user interface, data layer, and system controls. 5. To apply modern case tools to develop solutions.

Text Books
● K. K. Aggarwal & Yogesh Singh, Software Engineering, 2nd Ed., New Age International, 2005. ● Rajib Mall, Fundamental of Software Engineering, 3rd Edition, PHI Learning Private Limited ● I. Sommerville, Software Engineering, 9th Edition, Pearson Edu. ● Jalote Pankaj, Software Engineering, Narosa Publication

Reference Books:
● R. S. Pressman, "Software Engineering – A practitioner's approach", 5th Ed., McGraw Hill Int. Ed., 2001. ● James Peter, W. Pedrycz, "Software Engineering: An Engineering Approach", John Wiley & Sons.

Course Code	23COPC252
Course Title	Programming in Python Lab
Credits	Total: 2 (Practical - 2), L:0 T:0 P:2
Semester	IV (Computer Engineering)
Course Category	Mandatory

List of Practical

1. Exercise to set up Python Environment and IDE - Jupyter Notebook/ PyCharm/ IntelliJ IDEA/ other.
2. Exercises on variables and assigning values, type conversion.
3. Exercises on input, output, and formatted output.
4. Exercises on Python operators, Escape Sequences, and Comments.
5. Exercises on Operator Precedence and Associativity.
6. Exercises in number system conversion.
7. Exercises on expression evaluation.
8. Exercises on command line arguments.
9. Exercises on if statement, if...else statement, if...elif...else statement, conditional expressions, Nested Conditionals.
10. Exercises on looping, range() function, nested loops, the else suite.
11. Exercises on break statement, continue statement, pass statement, assert statement & return Statement.
12. Exercises on built-in functions.
13. Exercises on user-defined functions, passing & returning values, variable-length arguments.
14. Exercises on lambda functions, using lambdas with map(), reduce(), and filter function.
15. Exercises on Function Decorators, Generators & Iterators.
16. Exercises on nested functions & recursion.
17. Exercises on Importing python modules, using defined functions, and creating custom modules.
18. Exercises on array creation, accessing the elements & processing/manipulating them (single-dimensional & multidimensional up to three dimensions).
19. Exercises on string creation, string operations such as determination of length, indexing & slicing, the subscript operator, repeating the strings, concatenation, checking for substring & obtaining the position, comparing the strings, removing spaces, replacing substring, splitting, joining, checking starting & ending of a string, string & character testing methods, formatting strings, searching, sorting, insert substring into a string.
20. Exercises on List creation and manipulation, List methods, List Comprehension, List Cloning, Searching and Sorting Lists, Tuple creation, accessing elements & operations, List to Tuple conversion & Vice-versa.

Note: Additional Practical may be covered as per the syllabus by the faculty

Course Code	23COPC254
Course Title	Web Technologies
Credits	Total: 2 (Practical - 2), L:0 T:0 P:2
Semester	IV (Computer Engineering)
Course Category	Mandatory

List of Practical

The required list of experiments is provided as under. The examples cited here are purely indicative and not exhaustive. Attempts shall be made to perform all experiments.

1. Create a static web page which defines all text formatting tags of HTML in tabular format.
2. Create a static webpage using table tags, list tags, images in HTML.
3. Create a webpage using HTML form objects.
4. Create a webpage using HTML frames.
5. To Display list of items in different styles.
6. Create your own style sheets and use them in your web page.
7. Create a web page using XML.
8. Create JavaScript for conditional statements and loops.
9. Create JavaScript for arrays.
10. Create JavaScript for strings.
11. Create a PHP program for arrays.
12. Create a PHP program for loops.
13. Create a PHP program using a recursive function.
14. Create a PHP program for strings.
15. Create a PHP program to get data from XML file in PHP.
16. Create a PHP program to send HTML form data to email.
17. Create a PHP program to store the username in a cookie and check whether the user has successfully logged in or not.
18. Create a PHP program to set sessions on successful login.

Note: Additional Practical may be covered as per the syllabus by the faculty

Course Code	23COPC257
Course Title	Computer Hardware Maintenance & Troubleshooting Lab
Credits	Total: 2 (Practical - 2), L:0 T:0 P:2
Semester	IV (Computer Engineering)
Course Category	Mandatory

List of Practical
● Practical Should be designed to that Students should be able to do the Computer Hardware Maintenance and Trouble Shooting of Computers and Peripherals Note: Additional Practical may be covered as per the syllabus by the faculty