COURSE OBJECTIVES & OUTCOMES OF 3/4 YEAR UNDER GRADUATE CURRICULUM IN COMPUTER SCIENCE

(MAJOR,MINOR,MDC,SEC,VAC)

NISTARINICOLLEGE,PURULIA

AFFILIATED TO

SIDHO-KANHO-BIRSHA UNIVERSITY, PURULIA,WESTBENGAL

COMPUTER SCIENCE UG SYLLABUS FOR NEP 2020
SYLLABUS FOR COMPUTER SCIENCE OF SEMESTER –I

Course Type: **MAJ-1**
Semester: **1**
Course Code: **BCOSMAJ01C**
Course Title: **Computer Fundamentals and Programming using C**
(L-P-Tu): **4-2-0**
Credit: **6**
Practical/Theory: **Combined**

Fundamentals
Use of computer, history and generation of computer, Software/ Hardware, Computer peripherals, Basic component and storage, Fundamentals of Boolean Algebra, Logic Gates, Switching Functions, Simplification of Switching Functions, Data Representation and Basic Computer Arithmetic Number Systems and Codes, Base Conversion, Complements, Fixed and Floating-Point Representation, Character Representation, Addition, Subtraction, Magnitude Comparison. (10 Lectures)

Overview of C
Concept of Logic, Need of Programming, A Brief History of C, Form of a C Program, Basic syntax of C Program, Concept of Block, Compilation and Execution of a C Program, Use of Comments. (5 Lectures)

Data Types, Variables, Constants, Operators and Basic I/O
Basic Data Types, Declaration and Definition of Variables, Memory map of variable, Scope of Variables, Storage Class Specifiers, Variable Initialization, Constants, Type Qualifier (const), Operators, Formatted Console I/O, Unformatted Console I/O (getchar(), putchar()), Header Files. (5 Lectures)

Expressions and Statements
Operator Precedence, Type Conversion, Typecasting, Conditional Statements, Loops. (5 Lectures)

Arrays, Strings, Functions
Array, Types, Declaration and Initialization, Passing Arrays to Functions, Strings, General form of a Function, Function Declaration and Definition, Call by Value, Call by Reference, Arguments to *main()(argc and argv)*, Returning from a Function, Functions Returning Values, Function Returning Pointers, Functions of Type *void*, Declaring Variable-Length Parameter Lists, Recursion, Library Functions. (18 Lectures)

Derived Data Types (Structures and Unions)
Basics of Structures, Accessing Structure Members, Structure Assignments, Array of Structures, Pointers to Structures, Passing Structures to Functions, Nested Structures, Self-Referential Structures, Bit-Fields, Unions, typedef. (5 Lectures)

Pointers
Pointer Variables, Pointer Assignments, Pointer/Address Arithmetic, Pointer Comparison, Array of Pointers, Multiple Indirection, Pointers to Functions, Problems with Pointers.(5 Lectures)

Memory Allocation in C
Static and Dynamic Memory Allocation, C's Dynamic Allocation Functions (malloc(), calloc(), free()). (3 Lectures)

File I/O and Preprocessor Directives
Opening and Closing a File, Reading and Writing Text Files, Random Access in Files, Preprocessor Directives, Macros. (4 Lectures)

Programming Lab using C

- **Basics:** Print in Console, Arithmetic Operations, Swapping, Control Sequence.
- **Conditional Statement:** If, If else, If else ladder, Switch, Break.
- **Iteration:** For Loop, While Loop, Do While Loop, Continue Statement.
- **Function:** Simple Function, Recursion Structure, Union Pointer.

Course Objective of Major - 1:

1.1. Understand the functionality and history of computer.
1.2. Design the logical structure of a C Programming Language.
1.3. Identify the input, output functions and format Specifiers in C Programming.
1.4. Understand built-in and user defined functions in

Program Outcomes of Major - 1:

1.1. Able to write the pseudo code for the programs.
1.2. Proficient enough to implement the derived and the user defined data types.
1.3. Describe the pointer and file data structures concepts with its operations.
1.4. Proficient enough to debug and test cod

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END OF SEMESTER – I

SYLLABUS FOR COMPUTER SCIENCE OF SEMESTER –II

Course Type: **MAJ-2**
Semester: **2**
Course Code: **BCOSMAJ02C**
Course Title: **Data Structure**
Credit: **6**
Practical/Theory: **Combined**

Theory

Arrays

Single and Multi-Dimensional Arrays, Sparse Matrices (Array and Linked Representation).(6 Lectures)

Linked Lists

Singly, Doubly and Circular Linked Lists, Basic Operations on these Lists, Polynomial Representation using Linked List. (8 Lectures)

Stacks

Implementing Stack (Array and Linked Representation), Prefix, Infix, and Postfix Expressions; Utility, and Conversion of these Expressions from one to another, Applications of Stack, Limitations of Array Representation of Stack. (8 Lectures)

Queues

Array and Linked Representation of Queues, Circular Queues, Priority Queues.(6 Lectures)

Recursion

Developing Recursive Definitions of Simple Problems and their Implementations, Tracing Recursion, Analyzing Recursion, Towers of Hanoi. (6 Lectures)

Trees and Graphs

Introduction to Trees, Binary Trees, Tree Traversals, Binary Search Trees, Various operations on Binary Search Trees, Height-Balanced Trees, Various Operations on Adelson-Velski and Landis (AVL) Trees, BFS, DFS, Spanning Tree. (10 Lectures)

Searching and Sorting

Linear Search, Binary Search, Comparison of Linear Search and Binary Search, Selection Sort, Bubble Sort, Insertion Sort, Shell Sort, Quick Sort, Merge Sort, Comparison of Sorting Techniques. (10 Lectures)

Hashing

Direct Address Table, Introduction to Hashing, Chaining, Open Addressing (Linear Probing, Quadratic Probing, Double Hashing). (6 Lectures)

Data Structures Lab using Python

- Implement single and multi-dimensional arrays, and perform operations.
- Implement linked lists (singly, doubly, and circular) and their basic operations.
- Implement stacks (array and linked representation), and perform conversions between prefix, infix, and postfix expressions.
- Implement queues (array and linked representation), circular queues, and priority queues.
- Develop recursive solutions for simple problems and analyze recursion.
- Implement tree structures (binary trees, binary search trees, AVL trees) and perform tree traversals.
- Implement searching algorithms (linear search, binary search) and sorting algorithms (selection sort, bubble sort, insertion sort, shell sort, quicksort, merge sort).
- Implement hashing techniques (direct address table, chaining, open addressing).

Course Objective of Major - 2:

1.1 Understand various Data Structures and Algorithms.
1.2 To analyze the performance of Algorithms
1.3 Application of Data Structures and Algorithms to solve complex problems.
1.4 Solve problems involving graph, trees, heaps, sorting, searching etc.

Program Outcomes of Major - 2:

2.1. Understand basic Data Structures, Dynamic Memory Management.
2.2. Ability to implement abstract data types.
2.3. Ability to understand algorithm analysis procedure.
2.4. **Ability to understand time complexity and space complexity of various Algorithms.**

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END OF SEMESTER – II

SYLLABUS FOR COMPUTER SCIENCE OF SEMESTER –III

Course Type: **MAJ-3**
Semester: **3**
Course Code: **BCOSMAJ03C**
Course Title: **Computer Organization and Computer Architecture**
Credit: **6**
Practical/Theory: **Combined**

Theory

Digital Logic Circuits

Simplification, Fundamentals of Boolean Algebra, Combinational Circuits, Introduction to Sequential Circuits, Flip-Flops, Registers, Counters, Memory Units. (15 Lectures)

Data Representation and Basic Computer Arithmetic

Number Systems and Codes, Complements, Fixed and Floating-Point Representation, Character Representation, Addition, Subtraction, Multiplication and Division Algorithms for Integers. (10 Lectures)

Memory Organization

Memory system hierarchy, Main Memory Organization, Cache Memory, Virtual Memory. (15 Lectures)

Central Processing Unit

Register Organization, Instruction Set, Instruction Formats, Addressing Modes, Timing and Control, Instruction Cycle, Arithmetic and Logical Micro-operations, Stack Organization, Microprogrammed Control, RISC and CISC Architectures, Pipelining. (12 Lectures)

Input/ Output Organization

Introduction to computer buses, Bus control, I/O transfer techniques: Program controlled, Interrupt controlled and DMA, Interrupts. (8 Lectures)

Digital Electronics Lab

- Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
- Implementation of Boolean functions using logic gates in both SOP and POS forms.
- Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
- Implementation and verification of Multiplexer, De-multiplexer, Decoder, Encoder using logic gates.
- Implementation of 4x1 multiplexer using logic gates.
- Implementation of 4-bit parallel adder using 7483 IC.
- Design and verify 4-bit synchronous and asynchronous counter.

Course Objective of Major - 3:

3.1. Understand the basic structure of Computer System, Instructions and Addressing Modes.
3.2. Understand the basic components, functions, and the design of CPU, ALU and Control Unit.
3.3. Study and analyze the model for pipelining.
3.4. Understand Memory Hierarchy
3.5. Concept of Cache Mapping

Program Outcome of Major - 2:

3.1 Understand the fundamental concepts and principles of computer organization and architecture.
3.2 Understand the fundamental concepts of Memory Hierarchy
3.3 Understand the concepts of Cache Mapping
3.4 Understand the concepts of Direct Memory Access
3.5 Familiar with different instruction set architectures, such as CISC (Complex Instruction Set Computer) RISC (Reduced Instruction Set Computer).

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END OF SEMESTER – III

SYLLABUS FOR COMPUTER SCIENCE OF SEMESTER –IV

Course Type: **MAJ-4**
Semester: **4**
Course Code: **BCOSMAJ04C**
Course Title: **Database Management Systems**
Credit: **6**
Practical/Theory: **Combined**

Theory

Introduction
Traditional File Systems, Advantages of DBMS, Layered Architecture of DBMS, Data Independence, Data Models, Schemas and Instances, Database Users, DBA, Data Dictionary, Functional Components of DBMS. (6 Lectures)

Entity-Relationship Modeling
Entities, Attributes, Relationships, Integrity Constraints, Keys, Entity Sets, ER Diagrams, Specialization and Generalization, Aggregation. (8 Lectures)

Relational Model
Basic Concepts of a Relational Model, Relational Algebra, Introduction to Relational Calculus. (10 Lectures)

Relational Database Design
Database Anomalies, Functional Dependencies, Armstrong's Axioms, Closure of FD Sets, Minimal FD Set, Equivalence of FD Sets, Relational Decomposition, Lossless Decomposition, Dependency Preservation, Normalization, 1NF, 2NF, 3NF, BCNF. (10 Lectures)

SQL
Basic Structure, DDL, DML, DCL, Basic SQL Queries (SELECT, INSERT, DELETE, UPDATE), ORDER BY Clause, Complex Queries, Aggregate Functions, GROUP BY Clause, Nested Subqueries, Joins. (6 Lectures)

File Structure and Indexing
Fixed-length and Variable-length Records, Spanned and Unspanned Organization of Records, File Organization (Unordered, Sequential, Hashed), Indexing Structures for Files (Primary Index, Secondary Index, Clustering Index), Multilevel Indexing using B Trees and B+ Trees. (10 Lectures)

Transaction Processing
ACID Properties, Transaction States, Concurrent Execution, Serializability, Concurrency Control Protocols (Lock-Based Protocols). (10 Lectures)

DBMS Lab

- **Database Design**: Creating E-R diagrams and performing normalization.
- **SQL Basics**: Creating databases and tables, and using constraints.
- **Data Manipulation (DML):** Inserting, updating, deleting data, and writing queries.
- **Joins and Sub queries**: Implementing inner, outer joins, and subqueries.
- **Functions and Aggregates**: Using built-in functions and aggregation.
- **Advanced SQL Queries**: Writing complex queries and using views.
- **Transaction Management**: Understanding ACID properties, rollback, and commit.
- **Stored Procedures**: Creating and using procedures and functions.
- **Indexing:** Using indexes for query optimization.
- **Backup and Recovery**: Taking database backups and restoring them.

Course Objective Major - 4:

4.1. Understand the basic concepts of Data, Database, DBMS, Relational Database and SQL.

4.2. To Organize and Maintain the Database.

4.3. Develop E-R Models and familiar with basic database storage structures.

4.4. Understand Database Transaction and it's properties

Program Outcomes Major - 4:

4.1. Ability to understand the principles of Database Management System.

4.2. Understand Database Design Principles.

4.3. Understand the role of Transaction Processing and Concurrency Control Mechanisms.

4.4. **Easily recognize the importance of Database Analyse**

Course Type: **MAJ-5**
Semester: **4**
Course Code: **BCOSMAJ05C**
Course Title: **Operating Systems**
Credit: **6**
Practical/Theory: **Combined**

Theory

Introduction
Overview and Functions of Operating Systems, Operating Systems structures, services, system calls, Concept of Kernel, Basis Concept of Time Sharing, Distributed and Real-Time Operating System. (4 Lectures)

Process Management
Concept of a Process, Process Hierarchy, Threads, Multithreading Models, Scheduling Criteria, Process Scheduling Algorithms, Inter-Process Communication. (8 Lectures)

Process Synchronization:
Concept of Process Synchronization, The Critical Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors. (8 Lectures)

Principles of Deadlock:
Concept of Deadlock, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance and Detection, Recovery from Deadlock. (5 Lectures)

Memory Management:
Physical and Virtual Address Space, Swapping, Memory Allocation Strategies (Fixed and Variable Partitions), Concept of Paging, Segmentation, Virtual Memory, Demand Paging, Page Replacement algorithm, Thrashing. (15 Lectures)

File System:
File Concept, Access Method, Directory Structure, File Sharing and Protection, Implementation of File system and Directory, Allocation Methods, Free-Space Management. (5 Lectures)

Storage Management and I/O Systems:
Overview of Mass Storage Structure, Disk Structure and Attachment, Disk Scheduling Algorithm, RAID Structure, I/O Hardware, Kernel I/O Subsystem, Polling, Interrupts, Direct Memory Access. (15 Lectures)

Operating Systems Lab

Basics of UNIX commands.

- Basics of SHELL commands.
- SHELL programming.

Course Objective Major - 5:

5.1. Understand Functions, Services, and structure of Operating Systems.
5.2. Understand various scheduling policies, synchronization techniques
5.3. Understand basic principles of deadlock and related problems.
5.4. Understand different memory management techniques.
5.5. Understand CPU Scheduling
5.6. Understand Page Replacement Algorithm

Program Outcomes Major - 5:

5.1. Analyze basic concepts and features of Operating systems.
5.2. Implement algorithm of CPU scheduling, synchronization techniques to avoid deadlock.
5.3. To learn different memory management and disk scheduling techniques.
5.4. Synthesize the concepts of Process Synchronization
5.5. Understand the Basic Structure of Disk (Track, Sector ,Cylindered)

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END OF SEMESTER – IV

COMPUTER SCIENCE UG MINOR SYLLABUS FOR NEP-2020

SYLLABUS FOR MINOR COMPUTER SCIENCE OF SEMESTER –II

Course Type: ME-2
Semester: 2
Course Code: BCOSMEB12C
Course Title: Computer Fundamentals
(L-P-Tu): 3-1-0
Credit: 4
Practical/Theory: Combined

Theory

1.Introduction to Computers

Computer System: characteristics and capabilities. Computer Hardware and Software: Block Diagram of a Computer, Different Data Processing: Data, Data Processing System, Storing Data, Processing Data. Types of Computers: Analogue, Digital, Hybrid, General and Special Purpose Computers. Generation of Computers. Computer Systems: Micros, Minis & Main-frames. Limitations of Micro Computer, Number systems: Decimal Number system, Binary number system, Octal & Hexadecimal number system, 1's&2's complement Codes: ASCH, EBCDI Codes, Gray code & BCD, Logic Gates: AND, OR, NOT GATES and their Truth tables, Universal Gates, XOR gates.(15 Lectures)

2. Computer Peripherals

Introduction to Input Devices: Categorizing Input Hardware, Keyboard, Direct Entry — Card Readers, Scanning Devices — O.M.R., Character Readers, Thumb Scanner, MICR, Smart Cards, Voice Input Devices, Pointing Devices — Mouse, Light Pen, Touch Screen,
Computer Output: Output Fundamentals, Hardcopy Output Devices, Impact Printers, Non-Impact Printers, Plotters, Computer output Microfilm/Microfiche (COM) systems, Softcopy Output Devices, Cathode Ray Tube, Flat Screen Technologies, Projectors, Speakers. (8 Lectures)

3. Basic Components & Storage

Central Processing Unit: The Microprocessor, control unit, A.L.U., Registers, Buses, Main Memory, Main Memory (RAM) for microcomputers, Read Only Memory(ROM).
Storage Devices: Storage Fundamentals, Primary and Secondary Storage, Data Storage and Retrieval Methods — Sequential, Direct & Indexed Sequential, Tape Storage and Retrieval Methods Tape storage Devices, characteristics and limitations, Direct access Storage and Microcomputers – Hard Disks, Disk Cartridges, Direct Access Storage Devices for large Computer systems, Mass storage systems and Optical Disks, CD ROM.(12 Lectures)

4. Computer Software & Languages

System Software: System software Vs. Application Software, Types of System Software, Introduction and Types of Operating Systems. Boot Loader, Diagnostic Programs, BIOS, Utility Programs.
Application Software: Microcomputer Software, Interacting with the System, Trends in PC software, Types of Application Software, Difference between Program and
Packages. ComputerLanguages: Definition, Generations of computer languages, Types of Languages, Language Processors: Assembler, Interpreter, Compiler, Linker and Loader. Programming constructs, Algorithm & flowchart. (10 Lectures)

MS Office LAB

Computer Basics, MS Word, MS Excel, MS Powerpoint.

Course Objective Minor - 2:

ME_CO-2.1.	Understand Input, Output Devices, Functional Units of Computers.
ME_CO-2.2.	Understand types of Computers and History of Computers.
ME_CO-2.3.	Learn basics of MS Word, MS Excel, and MS PowervPoint.
ME_CO-2.4.	Learn the differences between different types of Software.

Program Outcomes Minor -2:

ME_PO- 2.1.	Understand the needs of Hardware and Software.
ME_PO- 2.2.	Ability to use the basic Softwares.
ME_PO- 2.3.	Perform basic functions of MS Word, MS Excel, and MS Power Point.
ME_PO- 2.4.	Analysing data using MS Excel.

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END OF SEMESTER – II (MINOR)

SYLLABUS FOR MINOR COMPUTER SCIENCE OF SEMESTER –III

Course Type: **ME-3**
Semester: **3**
Course Code: **BCOSMEB23C**
Course Title: **Programming Using Python**
(L-P-Tu): **2-2-0**
Credit: **4**
Practical/Theory: **Combined**

Theory

Introduction to Object Oriented Programming

Object-Oriented Programming, Characteristics, Object-Oriented Programming Paradigm, Benefits and Application, Properties. (5 Lectures)

Basics of Python

Python Installation, Python Variables and Data types, Identifiers and Keywords, Literals, Strings, Python Basic Operators Understandings (Arithmetic operator, Relational operator, Logical and Boolean operator, Assignment Operator, Bit wise operator). (5 Lectures)

Building Blocks and Control Statements

Standard Libraries in Python, Decision Control Flow Statement (if, if…else, if…elif…else), Nested if, While Loop, For Loop, Continue and Break Statements. (5 Lectures)

Arrays and Functions

Creating Arrays, Indexing and Slicing of Arrays, Array Operations, Syntax and Basics of Functions, Use of Functions, Function Arguments, Built-In Functions, Function Definition and Calling Functions, The return Statement. (5 Lectures)

Strings, Sets, Lists, Tuples and Dictionaries Creating Lists, List slicing, List Methods, Passing list to a function, Creating tuples, Tuple Operations, Creating Sets, Set Operations, Basic String Operations, Basics of Dictionaries, Creating a Dictionary, Formatting Dictionaries. (5 Lectures)

Files and Exception Handlings

Basic File Operations, Errors and Exceptions. (5 Lectures)

Programming Lab using Python

Practical part based upon the topics covered in the theory part.

Course Objective Minor - 3:

ME_CO -3.1. **Understand Object Oriented Programming Concept.**
ME_CO -3.2. **Familiar with Python IDLE.**
ME_CO -3.3. **Understand Loops, Decision Statements in Python.**
ME_CO -3.4. **Understand the concept of File Handling and Exception Handling.**

Program Outcomes Minor - 3:

ME_PO-3.1. **Ability to write database applications in Python.**
ME_PO-3.2. **Understand the basic concept of Class, Object, Function, List, Tuple, Set, Dictionary etc.**
ME_PO-3.3. **Design Graphical-user Interfaces in Python.**
ME_PO-3.4. **Understand Python applications for File Handling.**

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END OF SEMESTER – III (MINOR)

SYLLABUS FOR MULTIDISCIPLINARY COURSES (MDC) RELATED TO COMPUTER SCIENCE OF SEMESTER –I

Course Title: Computer Application

Course Type: MDC-1
Semester: 1
Course Code: BMDCCAP01T
(L-P-Tu): 3-0-0
Credit: 3
Practical/Theory: Combined

Introduction to Computer and Operating System
Computer and its Characteristics, Applications, Types, Components of Computer System, Input and Output Devices, Generation of Computer, Concept of Hardware and Software, Types of Software, Computer Memory, Concept of Computing, Data and Information, Computer Arithmetic and Number System (Binary, Decimal, Octal, Hexadecimal), Arithmetic Operations on Binary Numbers, ASCII, EBCDIC, BCD Codes, Operating System and it's functions. (20 Lectures)

MS Office
MS Word: Word Processing Basics, Opening and Closing Documents, Text Creation and Manipulation, Formatting Text, working with objects, Tables, Merging Documents, MS Excel: Spreadsheet basics, Working with Functions and Formulas, Charts and Graphs, Analyzing Data, Macro, MS PowerPoint: Opening and Viewing Slides, Auto Layouts, Customs Animation, Slide Transitions, Charts and Graphs, Hyperlinks. (15 Lectures)

Internet and Email
Introduction to Computer Network and its types, Internet and Intranet, Internetworking Devices, Transmission Media, www, Popular Web Browsing Software, Search Engines, Web Page, Website, URL, email, Applications of Internet. (10 Lectures)

Course Objective of MDC (Computer Application) :

MDC_CA_CO-1.1.	Learn about basic terminology of Computers.
MDC_CA_CO-1.2.	Familiar with Computer architecture.
MDC_CA_CO-1.3.	Understand Word Processing, Spreadsheet, and Presentation Graphics Software Skills.
MDC_CA_CO-1.4.	Understand basic ideas of Operating System and Computer Network.

Program Outcome of MDC (Computer Application):

MDC_CA_PO.1.1. Ability to use MS Office Applications.
MDC_CA_PO.1.2. Ability to analyze data using MS Excel.
MDC_CA_PO.1.3. Ability to understand Operating System and it's working.
MDC_CA_PO.1.4. Ability to use Internet safely.

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END OF SEMESTER – I (MDC)

SYLLABUS FOR SKILL ENHANCEMENT COURSES (SEC) PROVIDED BY DEPT. OF COMPUTER SCIENCE SEMESTER –I,II&III

Course Title: Data Science

Course Type: SEC-1
Semester: 1,2,3
Course Code: BCOSSEC01T
Course Title: Data Science
(L-P-Tu): 3-0-0
Credit: 3

Practical/Theory: Theory

Fundamental of Data Science and Data Mining:
Data Analysis, Data Analytics, Need for analytics, Introduction to Data Warehouse, OLAP, OLTP, Data pre-process, Structured and Unstructured Data. Dataset Centralization, Basic insights from Datasets, cleaning and preparing the data, Data mart, Data Mining Concepts, Data Mining Algorithms, Classification, Association Rule Mining. (15 Lectures)

Introduction to AI and Statistical Methods:
Concepts of AI, Types of Machine Learning, Supervised Learning, Unsupervised Learning, Mean, Median, Mode, Standard Deviation, Correlation, Regression, Covariance, Curve Fitting, Principal Component Analysis, Clustering. (20 Lectures)

Python Fundamentals:
Object Oriented Programming concept, class, object, methods, python data structure, control statements, user defined module, packages in python, file handling in python. (10 Lectures)

Course Objective of SEC (Data Science):

SEC_DS_CO -1,2,3.1.	Understanding key technologies of Data Science.
SEC_DS_CO -1,2,3.2.	Understand the concept of Association Rules, Classification, Regression, and Clustering.
SEC_DS_CO -1,2,3.3.	Analyse Data Mining Models.
SEC_DS_CO -1,2,3.4.	Demonstrate knowledge of Data Analysis Techniques.

Program Outcome of SEC (Data Science):

SEC_DS_PO-1,2,3.1.	Ability to perform data pre-processing.
SEC_DS_PO-1,2,3.2.	Ability to apply Mining Techniques.
SEC_DS_PO-1,2,3.3.	Implementation of Data Mining tools to solve complex problems.
SEC_DS_PO-1,2,3.4.	Hands-on experience with Data Analysis using Python Programming.

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END OF SEMESTER – I ,II & III(SEC)

SYLLABUS FOR VALUE-ADDED COURSES (VAC) PROVIDED BY DEPT. OF COMPUTER SCIENCE SEMESTER –III

Course Title: Digital Technology Solutions

Course Type: **VAC-2**
Semester: **3**
Course Code: **BVACCOS03T**
(L-P-Tu): **4-0-0**
Credit: **4**
Practical/Theory: **Theory**

Introduction:
Digital Technology, Benefits and Challenges of Digital Technology, Introduction to Computer Systems, System Software, Application Software, Types and Functions of Operating System.
(10 Lectures)

Information and Communication Technology:
Data Communication, Types, Computer Networks, Internet, Intranet, Internetworking Devices, Web Browser, www, Network Protocol, Search Engines, E-Mail, Social Networking, Introduction to E-Commerce, Basics of Digital Marketing. (15 Lectures)

Cyber Security:
Introduction to Cyber Security, Cyber security Safeguards, Concept of Cyberspace, Issues of Jurisdiction in Cyberspace, Intellectual Property Rights and Cyber Laws, National Cyber Security Policy. (15 Lectures)

E-Governance:
Importance and Features, E-Governance Initiatives in India, Smart Devices, Ethics, Method of E-Governance: GIS Based Management Systems, Business Process Reengineering (BPR). (10 Lectures)

Digital Financial Tools and Applications:
UPI (Unified Payment Interface), AEPS (Aadhaar Enabled Payment System), USSD (Unstructured Supplementary Service Data), Card (Debit/ Credit), Internet Banking: National Electronic Fund Transfer (NEFT), Real Time Gross Settlement (RTGS). (10 Lectures)

Course Objective of VAC (Digital Technology Solutions) :

VAC_DTS_CO-3.1.	To understand Communication Technology.
VAC_DTS_CO-3.2.	To understand Digital Technology.
VAC_DTS_CO-3.3.	To understand the features and importance of E-Governance.
VAC_DTS_CO-3.4.	To understand different types of Digital Financial Tools.

Program Outcomes of VAC (Digital Technology Solutions) :

VAC_DTS_PO-3.1.	Ability to understand Digital Paradigms.
VAC_DTS_PO-3.2.	To gain familiarity with Digital Technologies.
VAC_DTS_PO-3.3.	Capability to use different types of Digital Financial Tools.
VAC_DTS_PO-3.4.	Familiar with E-Governance.

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END OF SEMESTER – III(VAC)