Centre for Distance and Online Education (VTU-CDOE)

Bachelor of Computer Applications in Data Science

Scheme and Syllabus

Program Outcomes		
Sl. No	**Description**	**POs**
1	Ability to apply the knowledge of basic mathematics, Computing fundamentals, and programming concepts.	**PO1**
2	Ability to identify, formulate and analyze real-life problems to provide software solutions.	**PO2**
3	Ability to design and evaluate the application solutions and process to meet the requirements of various problem domains.	**PO3**
4	Capable to devise and conduct experiments, understand and interpret data to provide well informed conclusions.	**PO4**
5	Skill to use the recent techniques, hardware and software tools necessary for computer applications.	**PO5**
6	Ability to demonstrate computing knowledge with professional and ethical responsibilities.	**PO6**
7	Exhibiting as a successful computer application professional with an ability of independent learning for continuous need based development.	**PO7**
8	Ability as a strong team player or a leader by demonstrating knowledge with good understanding of principles of computing, finance and management.	**PO8**
9	Capable to understand, interpret, design and communicate complex computing activities to the computing community and society by effective presentation and documentation.	**PO9**
10	Able to understand the impact of computer solutions by considering global, economical, legal, environmental and societal context.	**PO10**
11	Effective handling of real-time problems as an individual or a leader in multidisciplinary environment.	**PO11**
12	Ability to identify the opportunity and develop solutions through innovative techniques to create value and wealth as a successful professional or an entrepreneur as per the societal needs.	**PO12**

Program Education Objectives (PEOs):

PEO 1: Apply Software Engineering for developing computer tools / solutions

PEO 2: Work in a team offline and online mode

PEO 3: High ethical & professional values and lifelong learning skills

BCA in Data Science

Semester - I				
Sl. No	**Course Code**	**Course Name**	**Type of the Course**	**Credits**
1	OBCD101	Foundation Mathematics -I	Core	4
2	OBCD102	Fundamentals of Computers	Core / Skill	4
3	OBCD103	Programming in C	Core / Skill	4
4	OBCD104	Introduction to Operating system	Core	4
5	OBCD105	Programming in C Lab	Skill	2
6	OBCD106	IT Lab	Skill	2
Total				20

Semester - II				
Sl. No	**Course Code**	**Course Name**	**Type of the Course**	**Credits**
1	OBCD201	Data Structures using C++	Core / Skill	4
2	OBCD202	Foundation Mathematics –II	Core	4
3	OBCD203	Professional Communication and Ethics	Core	4
4	OBCD204	Database Management System	Core / Skill	4
5	OBCD205	Database Management System Lab	Skill	2
6	OBCD206	Data Structure Lab	Skill	2
Total				20

Semester - III				
Sl. No	**Course Code**	**Course Name**	**Type of the Course**	**Credits**
1	OBCD301	Python Programming	Core / Skill	4
2	OBCD302	Object Oriented Programming Using Java	Core / Skill	4
3	OBCD303	Analysis & Design of Algorithm	Core	4
4	OBCD304	Computer Networks	Core	4
5	OBCD305	Python Lab	Skill	2
6	OBCD306	Java Lab	Skill	2
Total				20

Semester - IV				
Sl. No	**Course Code**	**Course Name**	**Type of the Course**	**Credits**
1	OBCD401	Web Programming	Core / Skill	4
2	OBCD402	Introduction to Numpy and Pandas	Core / Skill	4
3	OBCD403	Computer System & Network Security	Core	4
4	OBCD404	Introduction to Artificial Intelligence	Core	4
5	OBCD405	Web Lab	Skill	2
6	OBCD406	Programming Lab Using Python Numpy and Pandas	Skill	2
Total				20

Semester - V				
Sl. No	**Course Code**	**Course Name**	**Type of the Course**	**Credits**
1	OBCD501	Software Engneering	Core	4
2	OBCD502	.Net Programming Using C#	Core / Skill	4
3	OBCD503	Introduction to Machine Learning	Core	4
4	OBCD504	Introduction to Data Mining	Core	4
5	OBCD505	.Net Lab	Skill	2
6	OBCD506	Mini Project	Skill	2
Total				20

Semester - VI				
Sl. No	**Course Code**	**Course Name**	**Type of the Course**	**Credits**
1	OBCD601	Big Data	Core	4
2	OBCD602	Internship and Seminar	Core / Skill	4
3	OBCD603	Project Work	Core / Skill	12
Total				20

Foundation of Mathematics -I		Semester	I
Course Code	OBCD101	CIE Marks	30
		SEE Marks	70
Credits	4	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- The Curriculum supports the prerequisites to enhance their Mathematical knowledge towards their understanding mathematical Concepts in the concerned fields.

MODULE-1

MATRICES Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, Eigen values and Eigen Vectors of a Matrix, Caley-Hamilton Theorem (Statement only) Rank of a matrix, Row reduced echelon form and normal form Solution of homogeneous and non homogeneous system of linear equations.

MODULE-2

SETS: Sets, Subsets, Types of Sets, Operation on Sets, Cartesian product , Cardinality of sets and applications.

MODULE-3

ALGEBRAIC STRUCTURES: Binary operations, groups, semi-groups, subgroups, normal subgroups, isomorphism and homomorphism.
RINGS: Integral domains and fields.

MODULE-4

DIFFERENTIAL CALCULUS: Limits, Continuity, Successive differentiation, n^{th} derivative of standard functions, Leibnitz theorem for finding n^{th} derivative of product of two functions. Taylor's series and Maclaurin's series.

Partial differentiation: Partial derivatives, homogeneous function, Euler's theorem, maxima and minima for function of two variables.

MODULE-5

ORDINARY DIFFERENTIAL EQUATIONS (ODE'S)OF FIRST ORDER WITH FIRST DEGREE
Variable separable, Homogenous, Reducible to homogenous, Linear, Reducible to linear and Exact ODE'S. Application: Orthogonal Trajectories.

Course Outcomes:

CO1: Develop basic knowledge of matrices and to solve system of linear equations.

CO2: Understand the basic concepts of sets, functions and relations..

CO3: Understand the concept of groups, rings and isomorphism for algorithms.

CO4: Develop the knowledge about derivatives and applications of differentiation.

CO5: Solve first order with first degree ODE'S using standard methods.

Suggested Learning Resources:

Text Books Reference Books:

1. Discrete Mathematics by Guru Raja Chaar.

2. B.S.Grewal: Higher Engineering Mathematics Khanna Publishers, 43rd Edition.

3. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons

4. David C Lay: Linear Algebra and its Applications , Cambridge University Press

Fundamentals of Computers		Semester	I
Course Code	OBCD102	CIE Marks	30
		SEE Marks	70
Credits	4	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- A foundation from which they can appreciate the relevance and interrelationships of further courses in the field. This course provides an insight into the general structures of operating systems, database management systems, and computer networks.
- Operating System acts as a platform of information exchange between a computer's hardware and the applications running on it.
- Database Management Systems have become a part of all computer-based systems automating real word applications to handle data storage.
- Computer Networks deal with components and principles of networks and their protocols.

MODULE-1

Introduction to computers: Characteristics of computers, Classification of Digital Computer Systems: Microcomputers, Minicomputers, Mainframes, Supercomputers. Anatomy of Computer: Introduction, Functions & Components of a Computer, Central Processing Unit, Microprocessor, Storage units, Input and output Devices. How CPU and memory works. Program execution with illustrative examples. Introduction to microcontrollers.

MODULE-2

Operating System Fundamentals: Operating Systems: Introduction, Functions of an operating System, Classification of Operating Systems, System programs, Application programs, Utilities, The Unix Operating System, Basic Unix commands.

MODULE-3

Introduction to Database Management Systems: Database, DBMS, Why Database - File system vs DBMS, Database applications, Database users, Introduction to SQL, Data types, Classification of SQL-DDL with constraints, DML, DCL

MODULE-4

Computer Networks: Data transmission media, Network types and Topologies, Network devices, Network architecture, Application layer protocols, obtains essential system network information using system tools: network interfaces and their addresses, active processes using network communication. Basic network debugging: using trace route to discover route to a remote computer, ping to check network connectivity.

MODULE-5
Internet & Web Basics: Introduction, Features of Internet, Internet application, Services of Internet, Logical and physical addresses, Internet Service Providers, Domain Name System. Web Basics: Introduction to web, webpages and websites, web browsers, http/https, URL.

Course outcomes :

CO1: Discover the basics of computers, classification of computers, anatomy of computer, constituents and architecture, computer networks, microcontrollers.

CO2: Interpret operating systems, functions of o/s, classification of operating systems

CO3: Illustrate databases, why databases are used, sql, datatypes in sql, introduction of queries

Suggested Learning Resources:

Books

1. J. Glenn Brookshear," Computer Science: An Overview", Addision-Wesley, Twelfth Edition, 2014
2. Silberschatz A, Gagne G, Galvin PB. Operating system concepts. Ninth Edition, Wiley; 2012.
3. Cobbaut P. Linux Fundamentals. Samurai Media Limited; 2016.
4. Silberschatz A, Korth HF, Sudarshan S. Database system concepts. Sixth Edition, McGraw Hill;2010.

Programming in C		Semester	I
Course Code	OBCD103	CIE Marks	30
		SEE Marks	70
Credits	4	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- To develop skills in solving problems, to obtain knowledge about the structure of the programming language C and to develop the program writing and logical thinking skill.

MODULE-1

Problem Solving techniques: Introduction, Problem solving procedure, Algorithm: Steps involved in algorithm development , Algorithms for simple problems : To find largest of three numbers, factorial of number , check for prime number ,check for palindrome , Count no. of odd , even and zeros in list of integers. Flowcharts: Definition, advantages, Symbols used in flow charts. Flowcharts for simple problems mentioned in algorithms. Psuedocode.

MODULE-2

Introduction to C: Overview of C Program, Importance of C Program, Basic structure of a C-program, Execution of C Program. Constants, Variables & Data types: Character set, C token, Keywords & identifiers, Constants, Variables, data types, Declaration of variables, assigning values to variables, defining symbolic constants. **Operators and Expression:** Arithmetic, Relational, logical, assignment, increment & decrement, conditional, bit wise & special operators, evaluation of expressions, Precedence of arithmetic operators, type conversions in expressions, operator precedence & Associativity, built in mathematical functions.

MODULE-3

Managing Input and Output operations: Reading & writing a character, formatted input and output. Decision Making and Branching: Decision making with if statement, simple if statement, the if else statement, nesting of if … else statements, the else if ladder, the switch statement, the ?: operator, the goto statement. Decision making and looping: The while statement, the do statement, for statement, exit, break, jumps in loops.

MODULE-4

Arrays: Declaration, initialization & access of one dimensional & two dimensional arrays. Programs using one and two dimensional arrays- sorting and searching arrays. Handling of Strings: Declaring &initializing string variables, reading strings from terminal, writing strings to screen, Arithmetic operations on characters, String Handling functions, table of strings. **User defined functions:** Need for user defined functions, Declaring, defining and calling C functions return values & their types, Categories of functions: With/without arguments, with/without return values. Nesting of functions

MODULE-5
Recursion: Definition, example programs. Storage classes: The scope, visibility & lifetime of variables. Structures and union: Structure definition, giving values to members, structure initialization, comparison of structure variables, arrays of structures, arrays within structures, Structure and functions, structures within structures. Unions. **Pointers:** Understanding pointers, accessing the address of a variable, declaring & initializing pointers, accessing a variable through its pointer, pointer expression, pointer increments & scale factor, pointers & arrays, Pointer and strings, passing pointer variables as function arguments. **File Management**- Create in Read/Write and Append mode, copying file.
Course outcomes : **CO1**: Describe the C Programming language which includes the structure of a C program, Tokens, Expressions, Operators etc. **CO2:** Demonstrate conditional and iterative statements to write C programs. **CO3**: Construct the C programs that use pointers to access arrays and strings. **CO4**: Illustrate the user defined functions to solve real time problems. **Suggested Learning Resources:** **Books** 1. Computer Fundamentals and Programming in C – Reema Thareja, 2nd Edition, Oxford University, 2017. 2. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill 3. Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Prentice Hall of IndiaYashavanth Kanetkar, Let us C, Authentic Guide to C Programming Langauge, bpb publisher, 17th Edition, 2020 4. Yashavanth Kanetkar, Let us C, Authentic Guide to C Programming Langauge, bpb publisher, 17th Edition, 2020

Introduction to Operating system		Semester	I
Course Code	OBCD104	CIE Marks	30
		SEE Marks	70
Credits	4	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- The objectives of this subject are to provide the basic feature, function and interface with the hardware and application software to run the computer smoothly.

MODULE-1

Introduction: Definition, Computer system components, User view, system view and system goals , Batch Systems, Multi programmed Systems, Time-Sharing Systems, Real-Time Systems, System Components, Operating system services, System calls and system programs.

MODULE-2

Process: Process Concept, process state diagram process Control block , Process Scheduling- Scheduling queues, scheduler, Cooperating process, Inter process Communication, Threads- meaning , user threads , Kernel Threads, Multithreading Models, Threading Issues.

CPU Scheduling Basic concepts, Preemptive and Non-preemeptive Scheduling, Scheduling Criteria, Scheduling algorithms FCFS, Shortest job first Priority scheduling, Round Robin Scheduling.

MODULE-3

Process Synchronization The Critical section problem, Solution Approach critical section problem, Bakery Algorithm, Semaphores Meaning, Types of Semaphores, Synchronization problems- Bounded Buffer Problem, Readers-Writers problem and Dining Philosophers problem.

Deadlocks Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

MODULE-4

Memory Management Introduction, Logical versus physical address space, Dynamic Loading, Dynamic Linking, Swapping, Contiguous Allocation, Partitioned Memory Allocation, Paging, Segmentation, Segmentation with Paging.

MODULE-5
File System File concepts, File Attributes, File Operations, File Types, File Structure, Access Methods, Directory Structure, File-System Structure, Allocation Methods-Contiguous Allocation, Linked Allocation and Indexed Allocation, Free-Space Management.

Course outcomes:

CO1: Describe the basic concepts of OS with different types of OS, different services along with the various system calls

CO2: Interpret process management, various operations on process and Inter process communication

CO3: Simulate the various process scheduling algorithms

CO4:Analyze process synchronization, deadlocks, methods of handling deadlocks, preventing deadlocks etc

Suggested Learning Resources:

Textbooks & Reference Books

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 10th edition, Wiley-India, 2018
2. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013.
3. William Stallings Operating Systems: Internals and Design Principles, 9th Edition, Pearson.
4. Andrew S.Tanenbaum, "Modern operating Systems", fourth Edition, PHI Learning Pvt.Ltd., 2008

Programming in C Lab		Semester	I
Course Code	OBCD105	CIE Marks	30
		SEE Marks	70
Credits	2	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Practical		

Part A:

1. Program to read radius of a circle and to find area and circumference
2. Program to read three numbers and find the biggest of three
3. Program to demonstrate library functions in math.h
4. Program to check for prime
5. Program to generate n primes
6. Program to read a number, find the sum of the digits, reverse the number and check it for palindrome
7. Program to read percentage of marks and to display appropriate message (Demonstration of else-if)
8. Program to find the roots of quadratic equation (demonstration of switch Case statement)
9. Program to remove Duplicate Element in a single dimensional Array

Part B:

1. Program to find the length of a string without using built in function
2. Program to demonstrate string functions.
3. Program to demonstrate pointers in C
4. Program to read, display and to find the trace of a square matrix
5. Program to read, display and add two m x n matrices using functions
6. Program to read, display and multiply two m x n matrices using functions
7. Program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters.
8. Program to Reverse a String using Pointer
9. Program to Swap Two Numbers using Pointers
10. Program to demonstrate student structure to read & display records of n students.

Course outcomes :

CO1: Develop the C Program which includes the structure of a C program, Tokens, Expressions, Operators etc.
CO2: Demonstrate conditional and iterative statements to write C programs.
CO3: Construct the C programs that use pointers to access arrays and strings.
CO4: Design the user defined functions to solve real time problems.

IT Lab		Semester	I
Course Code	OBCD106	CIE Marks	30
		SEE Marks	70
Credits	2	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Practical		

Part A: Hardware

1. Identification of the peripherals of a computer, components in a CPU and their functions.
2. Assembling and disassembling the system hardware components of personal computer.
3. Basic Computer Hardware Trouble shooting.
4. LAN and WiFi Basics.
5. Operating System Installation – Windows OS, UNIX/LINUX, Dual Booting.
6. System Configuration – BIOS Settings, Registry Editor, MS Config, Task Manager, System Maintenance, Third-party System Maintenance Tools.

Part B: Software

1. Activities using Word Processor Software
2. Activities using Spreadsheets Software
3. Activities using Presentation Software
4. Activities involving Multimedia Editing
5. Tasks involving Internet Browsing
6. Flow charts: Installation and using of flowgarithms software for different arithmetic tasks like sum, average, product, difference, quotient and remainder of given numbers, calculate area of Shapes arrays and recursion.

Course outcomes :

CO1 : Discover the basics of computers, classification of computers, anatomy of computer, constituents and architecture, computer networks, microcontrollers.

CO2: Able to install operating systems such as windows, linux, dual booting, etc

CO3: Illustrate the activities using word processor, spreadsheets, presentation software, etc

SEMESTER - II

Data Structures using C++		Semester	II
Course Code	OBCD201	CIE Marks	30
		SEE Marks	70
Credits	4	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- Fundamentals of data structures
- Basic concepts related to stacks, queues.
- Fundamentals of graphs, Multilists and file organization

MODULE-1

Introduction to Data Structure and its Characteristics Array Representation of single and multidimensional arrays; Sparse arrays – lower and upper triangular matrices and Tri-diagonal matrices with Vector Representation.

MODULE-2

Stacks and Queues

Introduction and primitive operations on stack; Stack application; Infix, postfix, prefix expressions; Evaluation of postfix expression; Conversion between prefix, infix and postfix, introduction and primitive operation on queues, D- queues and priority queues.

MODULE-3

Lists

Introduction to linked lists; Sequential and linked lists, operations such as traversal, insertion, deletion searching, two way lists.

MODULE-4

Trees

Introduction and terminology; Traversal of binary trees; Recursive algorithms for tree operations such as traversal, insertion, deletion; Binary Search Tree

MODULE-5

Graphs

Graph terminology, Representation of graphs, path matrix, BFS (breadth first search), DFS (depth first search), topological sorting, Warshall's algorithm (shortest path algorithm.)

Course outcomes:

CO 1 : Identify different types of data structures, operations and algorithms
CO 2: Illustrate searching and sorting operations on files
CO 3:Demonstrate the working of stack, Queue, Lists, Trees and Graphs in problem solving & implement all data structures in a high-level language for problem solving

Suggested Learning Resources: Books

1. Adam Drozdek, "Data Structures and Algorithms in C++", 2013, Fourth Edition, Cengage Learning
2. Bhushan Trivedi, "Programming with ANSI C++", Oxford Press, Second Edition, 2012.
3. Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd , Fourth Edition 2010.
4. R.S. Salaria, " Data Structures & Algorithms" , Khanna Book Publishing Co. (P)Ltd..,2002

Foundation of Mathematics -II		Semester	II
Course Code	OBCD202	CIE Marks	30
		SEE Marks	70
Credits	4	Total Marks	100
		Exam Hours	3
Examination Nature (SEE)	Theory		

Course objectives:

- The objective of this course is to better understanding on the concepts of Sets, Relations and Functions, Laplace transformations and multiple integrals.

MODULE-1

RELATIONS AND FUNCTIONS:

RELATIONS: Definition with illustrations, Representation of relations to Zero-one matrix and digraphs.

FUNCTIONS: Definition, Domain and Range of function, Types of functions with illustrations.

MODULE-2

RELATIONS & FUNCTIONS

RELATIONS: Properties of relations, Equivalence relation, Partitions.

FUNCTIONS: Composite and Inverse Functions, Introduction to trigonometric, logarithmic and exponential functions.

MODULE-3

PARTIAL ORDER RELATIONS & LATTICES

Partial order sets, Representation of Posets using Hasse diagram, Chains, Elements of posets.

LATTICES

Algebraic systems, Principle of Duality, Basic properties, Sublattices, Distributed and Complemented Lattices.

MODULE-4

LAPLACE TRANSFORM:

Definition , Laplace transform of elementary functions, Periodic functions and Unit step functions, problems,

INVERSE LAPLACE TRSNSFORM:

Inverse Laplace transform of elementary functions, simple problems.

MODULE-5

MULTIPLE INTEGRALS:

Double and triple integrals, Evaluation of double integral by changing the order of integration.

Applications: Area and Volume by double integration.

Course Outcomes:

CO1: Understand the concepts of representations of relations and functions.

CO2: Develop knowledge of partitions, trigonometric and exponential of relations and functions.

CO3: Understand the concept of representation of Hasse diagram and types of Lattices.

CO4: Develop the knowledge about Laplace transform and its applications. .

CO5: Understand the basic concepts of Multiple integrals in Cartesian and polar forms**.**

Suggested Learning Resources:

Text Books

1. S.K. Sarkar, Discrete Mathematics by S.Chand & Co
2. B.S.Grewal: Higher Engineering Mathematics Khanna Publishers, 43rd Edition.
3. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons
4. David C Lay: Linear Algebra and its Applications , Cambridge University Press
5. J.P.Chauhan, BCA Mathematics Volume 2, Krishna Publications

Professional Communication and Ethics		Semester	II
Course Code	OBCD203	CIE Marks	30
		SEE Marks	70
Credits	4	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- To help students obtain an ability to communicate fluently in English; to enable and enhance the students skills in reading, writing, listening and speaking; to impart an aesthetic sense and enhance creativity

MODULE-1

Professional / Technical Communication

Introduction, process of communication, language as a tool, levels of communication, communication networks, importance of technical communication.

MODULE-2

Barriers to communication & Technology in communication

Definition of noise, classification of barriers, impact of technology, software for creating messages, software for writing documents, software for presenting documents, transmitting documents, effective use of available technology.

MODULE-3

Active Listening and effective presentation

Introduction, types of listening, traits of good listener, active versus passive listening, implications of effective listening.

Presentation purpose, analyzing audience and locals, organizing contents, preparing outline, visual aids, understanding nuances of delivery, kinetics, proxemics.

MODULE-4

Group communication, Research paper, Dissertations and Thesis

Group discussions, group discussions as part of selection process, meetings, conferences, research paper, dissertation, and thesis.

MODULE-5

Ethics for IT professional and IT users

Ethics in the business world, ethics in Information Technology(IT), IT professionals, ethical behavior of IT professional, IT users.

Course outcomes:

CO1: Develop vocabulary and language skills relevant to engineering as a profession

CO2: Analyze, interpret and effectively summarize a variety of textual content.

CO3: Create effective technical presentations

CO4: Acquire the Create effective technical presentations.

Suggested Learning Resources:
Books:

1. Meenakshi Raman and Sangeeta Sharama: "Technical Communication – Principles of Practices, Oxford University Press.
2. George Reynolds: "Ethics in Information Technology, Thomson Course Technology.
3. M.Govindarajan, S.Natarajananad, V.S.SenthilKumar "Engineering Ethics includes Human Values" -PHI Learning Pvt. Ltd-2009
4. Prof.A.R.Aryasri, DharanikotaSuyodhana "Professional Ethics and Morals" Maruthi Publications

Database Management System		Semester	II
Course Code	OBCD204	CIE Marks	30
		SEE Marks	70
Credits	4	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- Explain the foundation in database concepts, technology, and practice.
- Define SQL programming through a variety of database problems.
- Demonstrate the use of concurrency and transactions in database
- Design and build database applications for real world problems

MODULE-1

Introduction - Data Independence - The Three Levels Of Architecture - The External Level - Conceptual Level - Internal Level - Client/Server Architecture- System Structure , Instance and schema, Data Models, Types of DBMS

MODULE-2

Keys - CODD's Rules, Design Issues -ER – Model –Attribute types- Weak Entity Sets - Extended ER Features –ER to Relational Mapping, Structure Of Relational Databases

MODULE-3

Normalization –Anomalies- Functional Dependency: Armstrong's axioms- closure of a relation and closure of attribute– Lossless decomposition-1NF, 2NF, 3NF, Boyce - Codd Normal Form

MODULE-4

The Relational Algebra -- Query Processing and Optimization Transaction Processing: ACID properties, states of a transaction-Introduction to concurrency control

MODULE-5

DDL, Constraints, LIKE, BETWEEN, Conjunction and disjunction, Order by, Group by, Built in SQL functions- Set operations, Sub Queries-Joins-DCL – TCL- Views – Sequences – Index PL/SQL Basics – Exceptions – Cursors - Stored Functions – Triggers

Course Outcomes:

CO 1: Identify and define database objects, enforce integrity constraints on a database using RDBMS.

CO 2: Demonstrate the Structured Query Language (SQL) for database manipulation.

CO 3: Construct simple database systems & applications to interact with databases

Suggested Learning Resources:

Books

1. Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.

2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill.

3. Abraham Silberschatz, Henry F. Korth and S. Sudarshan"s Database System Concepts 9th EditionTata Mcgraw Hill Education Private Limited-2013

4. Introduction to Database Management System ,Satinder bal Gupta,Aditiya Mittal,2nd Edition,An imprint of Laxmi publications Private Limited-2017

Database Management System Lab		Semester	II
Course Code	OBCD205	CIE Marks	30
		SEE Marks	70
Credits	2	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Lab		

1. The EMP detail databases has a table with the following attributes.

The primary keys are underlined. EMP (EmpNo: int, name: string, dob: date, Ph No: int)

a) Create the above table.
b) Remove the existing attributes from the table.
c) Change the date type of regno from integer to string.
d) Add a new attribute Date of Joining(DOJ) to the existing table.
e) Enter five tuples into the table.
f) Display all the tuples in student table.

2. A LIBRARY database has a table with the following attributes.

LIBRARY (bookid:int, title: string, author: string, publication: string, yearpub:int, price: real) a) Create the above table.
b) Enter the five tuples into the table
c) Display all the tuples in student table.
d) Display the different publishers from the list.
e) Arrange the tuples in the alphabetical order of the book titles.
f) List the details of all the books whose price ranges between Rs. 100 and Rs. 300

3. The SALARY database of an organization has a table with the following attributes. EMPSALARY (empcod:int, emp_name: string, dob: date, department: string, salary: real)

a) Create the above table.
b) Enter the five tuples into the table
c) Display all the number of employees working in each department.
d) Find the sum of the salaries of all employees.
e) Find the sum and average of the salaries of employees of a particular department.
f) Find the least and highest salaries that an employee draws.

- **Consider the following database of student's enrollment in courses and books adopted for each course. STUDENT (regno: string, name: string, major: strong, bdate: date)**

  COURSE (course-no: int cname: string, dept: string)
  ENROLL (reg-no: string, course-no: int, sem: int, marks: int)
  BOOK-ADOPTION (course-no: int, sem: int, book-isbn: int)
  TEXT (book-isbn: int, book-title: string, publisher: string, author: string)
  a) Create the above tables by properly specifying the primary keys and the foreign keys
  b) Enter at least five tuples for each relation.
  c) Demonstrate how you add a new text book to the database and make this book be adopted by some department.
  d) List any department that has all its adopted books published by a specific publisher.

Course Outcomes:

CO 1: Design and develop database objects, enforce integrity constraints on a database using RDBMS.

CO 2: Illustrate the Structured Query Language (SQL) for database manipulation.

CO 3: Construct simple database systems & applications to interact with databases

Data Structure Lab		Semester	II
Course Code	OBCD206	CIE Marks	30
		SEE Marks	70
Credits	2	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Lab		

1. Write a menu driven C++ program to perform the following string operations without using string functions: (i) String Length (ii) String Concatenation (ii) String Reverse
2. Write a C++ program to search for an element in an array using Binary search.
3. Write a C++ program to sort a list of N elements using Merge sort technique.
4. Write a C++ program to sort a list of N elements of integer type using Quick Sort technique.
5. Write a C++ program to find the Binomial Coefficient using recursion.
6. Write a C++ program to simulate the working of Towers of Hanoi problem for N disks, print the moves taken by the problem using recursion.
7. Write a C++ program to demonstrate the working of a stack using an array. The elements of the stack may be integers. Operations to be supported are 1.PUSH, 2.POP 3.DISPLAY. The program should print appropriate messages for STACK overflow, Underflow.
8. Write a C++ program to implement the operations of a Queue using linked list.

Course outcomes:

CO 1 : Illustrate different types of data structures, operations and algorithms, searching and sorting operations on files

CO 2: Design & develop the working of stack, Queue, Lists in problem solving & implement all data structures

SEMESTER- III

Python Programming		Semester	III
Course Code	OBCD301	CIE Marks	30
		SEE Marks	70
Credits	4	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- Study the importance of Object Oriented Programming
- Explore the Object Oriented Programming concepts
- Explain the concept of Polymorphism, Inheritance
- Understand the creation of modules ,packages and organization of modules and packages

MODULE-1

Python Basics: Python interpreter, Python idle dynamically typed and strongly typed features basic data types, variables, expressions, statements, operators, flow of execution, Input and Output statements, Conditionals: Boolean values and operators, conditional (if) alternative (if-else) chained conditional (if –elif-else), Iteration: while, for, break, continue. pass, Implementing ‗for' through ranger *in and *not in operators for sequence traversal. Creating and executing: py scripts.

MODULE-2

Data Structures: Lists: append, extend, insert, Index, remove, pop, count, sort, reverse, slicing, list comprehension, Copying a list deep copy, shallow copy. Tuples- index, count. Usage, use of tuples as a swap function. Dictionaries keys, values, tuples, nested dictionaries dictionary comprehension, Strings- single line and multi-line strings, formatter, isdigit, isalpha, isalnum, islower, isupper, isspace, title, lower, Upper, strip, split. splitlines join etc. Sets union, intersection, Subset superset, difference Symmetric difference, copy, add, remove, discard Etc

MODULE-3

Functions & File Handling: built Functions- id, len, chr, ord etc defining and calling function, arguments, global versus local variables, defining and using lambda functions. map(),filter(), reduce() functions. Working with files: read, write and append modes: r, w, a, r+, w+, a+, reading-read(), readline(), readlines(), writing-write(), writelines(), seek(), tell(). Word count, copy file scripts through file handling concepts.

MODULE-4
Classes, modules and exceptional handling: Classes: Introduction, Member variables and defining methods, constructor, destructor, data encapsulation, inheritances, multiple inheritances, diamond problem solving technique of python. Modules inbuilt modules-sys, random, time etc. import, from import, from import * Constructing packages role of _init _.py. Exceptional Handling: The Try-exceptelse-finally block, the raise statement, the hierarchy of exceptions, adding exceptions.
MODULE-5
Database & GUI Programming: importing SQLite, connecting to database, creating table, insert, select, update, delete. Drop tables, accessing and modifying tables through python. Graphical user interfaces: event-driven programming paradigm, Tkinter module, creating simple GUI: buttons, labels, entry fields. Dialogs: widget attributes – sizes, fonts,colors layouts, nested frames

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO1: Explore the importance of Object Oriented Programming in python

CO2: Describe the concept of Polymorphism and Inheritance, etc.

CO3: Construct classes, modules, packages and organization of modules and packages, GUI programming.

Suggested Learning Resources:

Books

1. Introduction to Programming Using Python‖, 1 st Edition, Liang Y. Daniel, Pearson, 2017
2. Python the complete reference ,Martin C. Brown,4th Edition, McGraw Hill Education ,2018
3. Python 3 Object Oriented Programming, 2nd Edition, Unleash the power of Python 3 Objects by Dusty Phillips , PACKT Publishing.
4. Python Object–Oriented Programming :Build robust and maintainable Object-oriented python applications and libraries, Steven F. Lott, Dusty Philips,4th Edition, Packt Publishing Limited; 2021

Object Oriented Programming Using Java		Semester	III
Course Code	OBCD302	CIE Marks	30
		SEE Marks	70
Credits	4	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- Understand the Java program structure, data types and statements .
- Learn the concepts of class, objects and methods using JDK tools.
- Explore concepts of inheritance, overloading and multi-threaded programming
- Explore the use built-in packages and create user-defined packages Applet programming

MODULE-1

History and features of java, C++ Vs java, how java works, JAVA Program Structure, Java Virtual Machine concepts, java platform overview, Primitive data types, variables and constants, operators, expression statement- branching, looping and jumping, labeled statements.

MODULE-2

Classes, objects and methods: defining a class, creating object, adding variables and methods, Constructor Instances, field and methods initialization by constructors, Types of constructor, memory allocation and garbage collection, access methods Arrays, String and String buffer classes.

MODULE-3

Inheritance, Super class Subclass, basic types, using super keyword, abstract and final classes, method overriding, dynamics method dispatch. Method overloading, Interface, Thread, Thread Life cycle, Multithreading examples, Synchronized threading, Priorities of thread.

MODULE-4

Exception handling: fundamental, exception types, uncaught exception, throws, throw, try-catch, finally, built in exception, creating your own exception, Packages, Built in Packages, Creating your own Package, input/output-basics streams, Byte and character streams.

MODULE-5

Applet programming-Local and Remote Applets, Applet Vs Application, creating and executing java applets, inserting applets in a web page, java security, passing parameter to applets, Aligning the Display, HTML Tags & Applet Tag, Getting Input from User.

Course Outcomes:

CO 1: Explore the object-oriented concepts and JAVA.

CO 2: Demonstrate programs to solve real world problems in Java.

CO 3: Construct simple GUI interfaces for a computer program to interact with users

Suggested Learning Resources:

Books

1. Programming with Java,6th Edition, E. Balaguruswamy, McGraw-Hill, 2019
2. Internet and Java Programming, 1 st Edition, Prabhu, R. Krishnamurthy, New Age International,2013
3. Java Fundamentals, A comprehensive Introduction by Herbert Schildt, Dale Skrien. Tata McGraw Hill Edition 2013. (Chapters:1,2,3,4,5,6,7,8,9,10,11,12,13,15,22,23,24,25,26)
4. Java6 Programming, Black Book, KoGenT, Dreamtech Press, 2012.

Analysis & Design of Algorithm		Semester	III
Course Code	OBCD303	CIE Marks	30
		SEE Marks	70
Credits	4	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- Explain various computational problem solving techniques.
- Apply appropriate method to solve a given problem.
- Describe various methods of algorithm analysis.

MODULE-1

Introduction: Algorithms, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Fundamental Data Structures. Fundamentals of the Analysis of Algorithm Efficiency: The Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non-recursive and Recursive Algorithms, Empirical Analysis of Algorithms

MODULE-2

Brute Force Method: Selection Sort and Bubble Sort, Sequential Search, Brute-Force String Matching, Exhaustive Search, Depth-First Search and Breadth-First Search. Decrease and Conquer: Insertion Sort, Topological Sorting, Algorithms for Generating Combinatorial Objects, Decreaseby-a-Constant-Factor Algorithms.

MODULE-3

Divide and Conquer: Merge Sort, Quick Sort, Binary Tree Traversals and Related Properties, Strassen's Matrix Multiplication. Space and Time Tradeoffs: Sorting by Counting, Input Enhancement in String Matching, Hashing. Dynamic programming: Binomial Coefficient, Principle of Optimality, Optimal Binary Search Trees, Knapsack Problem and Memory Functions, Warshall's and Floyd's Algorithms.

MODULE-4

Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees. Limitations of Algorithm Power: Lower-Bound Arguments, Decision Trees, P, NP and NP Complete Problems.

MODULE-5

Coping with the Limitations of Algorithm Power: Back Tracking: n Queens problem, Hamiltonian Circuit Problem, Subset-Sum Problem. Branch-and-Bound: Assignment Problem, Knapsack Problem, Traveling Salesman Problem.

Course Outcomes:

CO 1: Describe computational solution to well known problems like searching, sorting etc.

CO 2: Identify the computational complexity of different algorithms.

CO 3: Explain an algorithm using appropriate design strategies for problem solving

Suggested Learning Resources:

Books

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson, 2012
2. Horowitz, Sahni, Rajasekaran, "Fundamentals of Computer Algorithms", 2/e, Universities Press, 2007.
3. Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2rd Edition, 2009. Pearson.
4. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press

Computer Networks		Semester	III
Course Code	OBCD304	CIE Marks	30
		SEE Marks	70
Credits	4	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- Comprehend the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data.
- Explain with the basics of data communication and various types of computer networks;
- Demonstrate Medium Access Control protocols for reliable and noisy channels.
- Expose wireless and wired LANs.

MODULE-1

Definition and concept of networking transmission modes. Transmission media, Internet working, Connecting devices, Adapters. Routers, evolution of Network Technology, Standards and protocols, Introduction to Analog signals, Digital signal, Modulation and Demodulation, OSI Reference Model-Layered structure, function of each layer, protocol used

MODULE-2

Switching-Message. Packet, and Circuit Switching, Multiplexing – FDM, TDM WDM, SONNET, Cellular network, satellite network, IEEE 802 STANDARDSCSMA/CD, TOKEN BUS, TOKEN RING, FDDI. Routing algorithms — Distance Vector routing, Link state routing, TCP/IP- Overview. Architectures, functions of each layers and protocol, IP addressing, subnet and subnet mask, IP addressing-classes, IPV4 IPV6.

MODULE-3

Bootstrap protocol, DHCP, mobile IP, DNS, Telnet, SMTP HTTP. SNMP, FTP. ATM network, ATM Architecture, BISND reference model. ATM applications, Data link control — Line discipline, Flow control, Error control. Encryption — Convention Encryption, Conventional Encryption Model, Steganography, Classical Encryption Techniques, Simplified DES. Block Cipher Design Principles. Block Cipher Modes of Operation.

MODULE-4

Cryptography, Public key encryption and hash functions ,public key cryptography, principles of public key cryptosystems, The RSA algorithm, Message Authentication and Hash functions, Authentication Requirements, Authentication Functions, Message Authentication Codes, MAC Algorithm, Hash Function algorithms, Secure Hash Algorithm, IP Security

MODULE-5
Network Security at various layers, Secure-HTTP. SSL, PSP, authentication Header, Key distribution protocols. Digital Signature, Digital Certificate, Security protocols, Levels of security. Virus and Worms related threats. Malicious programs, firewall. Design principles, Wifi, Bluetooth, Infrared.

Course Outcomes:

CO 1: List the various components of data communication and transmission modes

CO 2: Describe the fundamentals of digital communication and switching.

CO 3: Explain data link layer protocols and network security at various layes.

Suggested Learning Resources:

Books

1. Data Communication‖, 4 th Edition, Behrouz A. Forouzen, Tata McGraw Hill Education,2006
2. Computer Networks‖, 5 th Edition, Andrew S. Tanenbaum, Pearson, 2011
3. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
4. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.

Python Lab		Semester	III
Course Code	OBCD305	CIE Marks	30
		SEE Marks	70
Credits	2	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Lab		

1. Write a program to demonstrate basic data type in python
2. Create a list and perform the following methods
   1) insert( ) 2) remove( ) 3) append( ) 4) len( ) 5) pop( ) 6) clear( )
3. Create a tuple and perform the following methods
   1) Add items 2) len( ) 3) check for item in tuple 4)Access items
4. Create a dictionary and apply the following methods
   1) Print the dictionary items 2) access items 3) use get( ) 4) change values 5) use len( )
5. Write a program to create a menu with the following options
   1. TO PERFORM ADDITITON 2. TO PERFORM SUBTRACTION 3. TO PERFORM MULTIPICATION 4. TO PERFORM DIVISION Accepts users input and perform the operation accordingly. Use functions with arguments.
6. Write a python program to print a number is positive/negative using if-else.
7. Write a program for filter() to filter only even numbers from a given list.
8. Write a python program to print date, time for today and now
9. Write a python program to add some days to your present date and print the date added.
10. Write a program to count the numbers of characters in the string and store them in a dictionary data structure
11. Write a program to count frequency of characters in a given file.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO1: Demonstrate the importance of Object Oriented Programming in python

CO2: Experiment the concept of Polymorphism and Inheritance, etc.

CO3: Simulate classes, modules, etc.

Java Programming Lab		Semester	III
Course Code	OBCD306	CIE Marks	30
		SEE Marks	70
Credits	2	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Lab		

1. Substring Removal from a String. Use String Buffer Class.
2. Determining the Perimeter and Area of a Triangle. Use Stream Class.
3. Determining the Order of Numbers Generated randomly using Random Class.
4. Implementation of Point Class for Image Manipulation.
5. String Manipulation Using Char Array.
6. Database Creation for Storing E-mail Addresses and Manipulation.
7. Usage of Vector Classes.
8. Interfaces and Packages
9. Implementing Thread based Applications
10. Program on Exception Handling.

APPLETS:

1. Working with Frames and Various Controls.
2. Working with Dialog Box and Menus.
3. Working with Colors and Fonts.
4. Drawing various shapes using Graphical statements.
5. Working with panel and all types of Layout.

Course Outcomes:

CO 1: Demonstrate the object-oriented concepts and JAVA.

CO 2: Experiment programs to solve real world problems in Java.

CO 3: Illustrate simple GUI interfaces for a computer program to interact with users

SEMESTER - IV

Web Programming		Semester	IV
Course Code	OBCD401	CIE Marks	30
		SEE Marks	70
Credits	4	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- Explain advanced features of the web programming.
- Define the characteristics of HTML,XHTML,Java script,XML.
- Explore the basic principles of Web programming
- Enhance problem solving and programming skills in web programming with extensive programming projects.

MODULE-1

Fundamentals of Web: Internet, WWW, Web Browsers, and Web Servers, URLs, MIME, HTTP, Security, The Web Programmers Toolbox. XHTML: Origins and evolution of HTML and XHTML, Basic syntax, Standard XHTML document structure, Basic text markup, Images, Hypertext Links, Lists, Tables.

MODULE-2

HTML and XHTML: Forms, Frames in HTML and XHTML, Syntactic differences between HTML and XHTML. CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The Box model, Background images, The and tags, Conflict resolution.

MODULE-3

Java Script: Overview of JavaScript; Object orientation and JavaScript; General syntactic characteristics; Primitives, Operations, and expressions; Screen output and keyboard input; Control statements; Object creation and Modification; Arrays; Functions; Constructor; Pattern matching using expressions; Errors in scripts; Examples

MODULE-4

Java Script and HTML Documents: The JavaScript execution environment; The Document Object Model; Element access in JavaScript; Events and event handling; Handling events from the Body elements, Button elements, Text box and Password elements; The DOM 2 event model; The navigator object; DOM tree traversal and modification.

MODULE-5
Dynamic Documents with JavaScript: Introduction to dynamic documents; Positioning elements; Moving elements; Element visibility; Changing colors and fonts; Dynamic content; Stacking elements; Locating the mouse cursor; Reacting to a mouse click; Slow movement of elements; Dragging and dropping elements. XML: Introduction; Syntax; Document structure; Document Type definitions; Namespaces; XML schemas; Displaying raw XML documents; Displaying XML documents with CSS; XSLT style sheets; XML Processors; Web services.

Course Outcomes:

CO 1: Discover HTML and CSS syntax and semantics to build web pages.

CO 2: Demonstrate format tables and forms using HTML and CSS

CO 3: Construct Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.

Suggested Learning Resources:

Books

1. Robert W Sebesta, "Programming the World Wide Web", 4th Edition, Pearson Education, 2008.
2. Web Programming By Chris Bates , Wiley Publications
3. HTML5 Black Book by Dreamtech
4. 4. Angular JS By Krishna Rungta

Introduction to Numpy and Pandas		Semester	IV
Course Code	OBCD402	CIE Marks	30
		SEE Marks	70
Credits	4	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- **Explore the basic concepts of IPython and Jupyter**
- **Interpret computational environments for scientists using Python, NumPy**
- Explain the Data manipulation with pandas
- Define the working with data sets

MODULE-1

IPython: Beyond Normal Python: Help and Documentation in IPython, Keyboard Shortcuts in the IPython Shell, IPython Magic Commands, Input and Output History, IPython and Shell Commands, Errors and Debugging.

MODULE-2

Introduction to NumPy: Understanding Data Types in Python, The Basics of NumPy Arrays, Computation on NumPy Arrays: Universal Functions, Aggregations: Min, Max, and Everything In Between.

MODULE-3

Computation on Arrays: Broadcasting,Comparisons, Masks, and Boolean Logic,Fancy Indexing, Sorting Arrays, Structured Data: NumPy's Structured Arrays

MODULE-4

Data Manipulation with Pandas: Introducing Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing

MODULE-5

Combining Datasets: Concat and Append, Combining Datasets: Merge and Join, Aggregation and Grouping, Pivot Tables, Vectorized String Operations, Working with Time Series, High-Performance Pandas: eval() and query(),Further Resources.

Course Outcomes:

CO 1**:** Describe the working of Ipython
CO 2: Summarize the application using NumPy and Array
CO 3: Apply the application for using Pandas and datasets

Suggested Learning Resources:

Books

1. Python Data Science Handbook by *Jake Vander Plas*
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist'', 2nd edition,Updated for Python Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)
3. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
4. Shai Vaingast, "Beginning Python Visualization Crafting Visual Transformation Scripts", Apress, 2nd edition, 2014. 6. Wes Mc Kinney, "Python for Data Analysis", O'Reilly Media, 2012.

Computer System & Network Security		Semester	IV
Course Code	OBCD403	CIE Marks	30
		SEE Marks	70
Credits	4	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

1. To understand basics of Network Security.
2. To be able to secure a message over insecure channel by various means.
3. To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
4. To understand various protocols for network security to protect against the threats in the networks.

MODULE-1

Introduction: Attack, Services and Mechanism, Model for Internetwork Security. Cryptography: Notion of Plain Text, Encryption, Key, Cipher Text, Decryption and cryptanalysis; Public Key Encryption, digital Signatures and Authentication.

MODULE-2

Network Security: Authentication Application: Kerveros, X.509, Directory Authentication Service, Pretty Good Privacy, S/Mime

MODULE-3

IP security Architecture: Overview, Authentication header, Encapsulating Security Pay Load combining Security Associations, Key Management.

MODULE-4

Web Security: Requirement, Secure Socket Layer, Transport Layer Security, and Secure Electronic Transactions.

MODULE-5

Network Management Security: Overview of SNMP Architecutre-SMMPVI1 Communication Facility, SNMPV3. **System Security:** Intruders, Viruses and Relate Threats, Firewall Design Principles. Comprehensive examples using available software platforms/case tools, Configuration Management.

Suggested Learning Resources: Books

1. W. Stallings, Networks Security Essentials: Application & Standards, Pearson Education, 2000.
2. W.Stallings, Cryptography and Network Security, Principles and Practice, Pearson Education, 2000.
3. Cryptography and Network Security, Behrouz A. Forouz.an, TMH, 2007.
4. Cryptography and Network Security, Atul Kahate, TMH, 2003.

Introduction to Artificial Intelligence		Semester	IV
Course Code:	**OBCD404**	**CIE+SEE Marks**	**30 +70=100**
Credits	**04**	**Exam Hours**	**03**
Examination type (SEE)		**Theory**	

Course Objectives:

CLO 1. Illustrate the reasoning on Uncertain Knowledge

CLO 2. Explore the explanation-based learning in solving AI problems

CLO 3. To explore advanced career opportunities

CLO 4. Demonstrate the applications of soft computing and Evolutionary Computing algorithms

Module-1

Artificial Intelligence – Basics, The AI Problems – The Underlying Assumption – What is an AI technique – Criteria for Success. Problems, Problem Spaces and Search – Defining Problem as a State Space Search – Production Systems – Problem Characteristics – Production System Characteristics – Issues in the design of Search Programs.

Module-2

Heuristic Search Techniques - Generate – and – Test – Hill Climbing – Best-First Search – Problem Reduction – Constraint Satisfaction - Means - Ends Analysis. Knowledge Representation issues – Representations and Mapping - Approaches to knowledge Representation – Issues in knowledge Representation – The Frame Problem. Case study based on search algorithms.

Module-3

Using Predicate Logic – Representing simple facts in Logic – Representing Instance and Isa Relationship – Computable Functions and Predicates – Resolution – Natural Deduction. Representing Knowledge Using Rules – Procedural versus Declarative knowledge – Logic Programming – Forward versus Backward Reasoning – Matching – Control Knowledge. Case study based on reasoning

Module-4

Reasoning under Uncertainty – Introduction to Non-monotonic Reasoning – Augmenting a Problem Solver – Implementation: Depth - First Search, Fuzzy Logic. Game Playing - The Minimax Search Procedure – Adding Alpha-Beta Cut-offs. Applications of artificial intelligence- Case study on social networks using neural networks, DNA sequencing using AI techniques.

Textbooks / References:

1. Artificial Intelligence (Second Edition) – Elaine Rich, Kevin knight (Tata McGraw-Hill)

2. A Guide to Expert Systems – Donald A. Waterman (Addison-Wesley)

3. Principles of Artificial Intelligence – Nils J. Nilsson (Narosa Publishing House)

4. Introduction to Artificial Intelligence – Eugene Charnaik, Drew McDermott (Pearson Education Asia)

Course Outcomes

Cos	Description
CO1	To be aware of the basics of AI and its need along with the issues in designing search problems.
CO2	Understand and apply various search algorithms in real world problems.
CO3	To get a thorough idea about the fundamentals of knowledge representation, inference and theorem proving.
CO4	Express and comprehend the working knowledge of reasoning in the presence of incomplete and/or uncertain information.
CO5	To gain the aptitude to apply knowledge representation and reasoning to real-world problems

CO-PO Mapping:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1					2	1	1	2
CO2	2	1	1			1		2	2	1	1	2
CO3	3	2	1	1					2	1		2
CO4	1	2	1	1		1	1	2	1	1	1	2
CO5	2	1	1	1			1	2	1	1	1	2

Web Lab		Semester	IV
Course Code	OBCD405	CIE Marks	30
		SEE Marks	70
Credits	2	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Lab		

1. Create a Web page by making use of the following tags : Headers, Linking and Images.
2. Create a Web page that will have the following: Frames, Unordered Lists, Nested and ordered Lists
3. Create a Web page Layout with Tables and all its attributes
4. Create a Web page that will have Application form (Forms) , make use of Image Maps and Tags
5. Create an External Style Sheet that defines the style for the following tag : H1, H2, Body , P, Li .
6. Create an Internal Style Sheet that defines a style for Positioning elements & setting the background (color / image)
7. Create a Style Sheets that defines the style with class method , Id method , make use of DIV and Span TAG
8. Write a JavaScript program to Demonstrate the use of Variable , message box , and loops
9. Write a JavaScript Program to demonstrate Functions (predefined / user defined)
10. Write a JavaScript program to demonstrate Event Handling
11. Object Creation and modification in JavaScript
12. Write a PHP program to demonstrate GET and POST method of passing the data between pages

Course Outcomes:

CO 1: Illustrate HTML and CSS syntax and semantics to build web pages.

CO 2: Demonstrate format tables and forms using HTML and CSS

CO 3: Experiment Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.

Programming Lab Using Python Numpy and Pandas		Semester	IV
Course Code	OBCD406	CIE Marks	30
		SEE Marks	70
Credits	2	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Lab		

1. Implement a python program to demonstrate the following using NumPy a) Array manipulation, Searching, Sorting and splitting. b) broadcasting and Plotting NumPy arrays
2. Implement a python program to demonstrate Data visualization with various Types of Graphs using Numpy
3. Write a Python program that creates a mxn integer array and Prints its attributes using matplotlib
4. Write a Python program to demonstrate the generation of linear regression models.
5. Write a Python program to demonstrate the generation of logistic regression models using
6. Write a Python program to demonstrate Time series analysis with Pandas.

Course Outcomes:
CO 1: Demonstrate the working of Ipython with the applications o fNumPy and array
CO 2: Illustrate the application for using Pandas and datasets

Software Engineering		Semester	V
Course Code	OBCA501	CIE Marks	30
		SEE Marks	70
Credits	4	Total Marks	100
		Exam Hours	3
Examination nature (SEE)	Theory		

Course objectives:

- Use modern tool to create dynamic diagrams to represent the design for the given problem.
- Draw class diagram , analyse the different types of association that exists as per the given problem and represent them using UML notations.
- Analyse the given system to identify actors, use cases to design use case diagrams for the given problem using RSA/open source tool.
- Design the static/dynamic models to meet application requirements of the given system and generate code (skeleton) using the modern tool.

MODULE-1

Introduction: Software Products and Software process, Process models: Waterfall modal, Evolutionary Development, Bohemia's Spiral model, Overview of risk management, Process Visibility, Professional responsibility. Computer based System Engineering: Systems and their environment, System Procurement, System Engineering Process, System architecture modelling. Human Factors, System reliability Engineering.

MODULE-2

Requirements and Specification: The requirement Engineering Process, The Software requirement document, Validation of Evolution of requirements, Viewpoint – oriented & method based analysis , system contexts , Social 7 organizational factors . Data flow , Semantic, Objects, models , Requirement Specification, Non functional requirement.

MODULE-3

Software Prototyping: Prototyping in software process, Prototyping techniques, User interface prototyping. Software Design: Design Process, Design Strategies, Design Quality, System Structuring control models, Modular decomposition, Domain Specific architecture.

MODULE-4
Object Oriented& function oriented design: Objects, object Classes and inheritance Object identification, An object oriented design example, Concurrent Objects, Data flow design Structural decomposition, Detailed Design, A Comparison of design Strategies. User interface design: Design Principles, User System interaction, Information Presentation, User Guidance, Interface Evaluation.
MODULE-5
Software Verification and Validation : The testing Process , Test Planning & Strategies, Black Box , Structural, interface testing , Program inspections , Mathematically based verification, Static analysis tools, Clean room software development. Management Issues: Project management, Quality management, Software cost estimation, Software maintenance.
Course outcomes: **CO 1: Describe** a software system, component, or process to meet desired needs within realistic constraints. **CO 2**: Compare professional and ethical responsibility' **CO 3:** Apply the techniques, skills, and modern engineering tools necessary for engineering practice, design, implement, verify, validate, implement, and maintain software systems or parts of software systems **Suggested Learning Resources:** **Books** 1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012. 2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML,2nd Edition, Pearson Education,2005. 3. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill. 4. Stephan R. Schach, "Object oriented software engineering", Tata McGrawHill,2008

Net Programming Using C#		Semester	V
Course Code	OBCD502	CIE Marks	
Teaching Hours/Week (L:T:P: S)		SEE Marks	
Total Hours of Pedagogy		Total Marks	
Credits	4	Exam Hours	
Examination nature (SEE)	Theory		

Course objectives:

- The main objective of this course is designed to introduce the student a new object - oriented programming language C# within Microsoft.Net Framework. This course covers the essentials to use managed programming to create the windows Applications using C#.NET.

MODULE-1

.Net Framework Overview- Architecture-.Net Framework class Libraries-CLR-Metadata-Interoperability-Assemblies-the .net Packaging system-CLR-MSIL , Introduction to Visual Studio.Net-C# Programming Concepts-Predefined Types- Value types and reference type, Classes and Objects, Constructors and methods , Conditional statements, loops, arrays , Collection classes: ArrayList , HashTable, Stack ,Queue, indexers and properties

MODULE-2

String class: methods and properties of string class, enumerations, boxing and unboxing, OOPS concepts: Encapsulation, data hiding, inheritance, interfaces, polymorphism, operator overloading, overriding Methods, Static Class members, Delegates and events. Exception Handling, garbage collector, generics and collection

MODULE-3

Basics of Windows Programming- Event Driven Programming, Windows Forms, Using common controls-Labels, textboxes, buttons, check boxes, radio button, progress bar, combo box, list box. Components-timer, imagelist, Menus, Modal and Modeless Dialog Boxes, MDI, Mouse and keyboard event handling.

MODULE-4

Introduction to ADO.Net-Object Model- System. Data Namespace- Data Bound controls-Connected Mechanism-Disconnected mechanism-.Net Data Providers.

MODULE-5

Files: System.IO, directory and file types, Stream readers and stream writers, working with binary data.

Suggested Learning Resources:

Books

1. C# 4.0 the Complete Reference by Herbert Schildt
2. Latest version of Andrew Trolsens C# text from Apress(Pro C# 5.0 and the .NET Framework 4.5)
3. Robert Powel, Richard Weeks, C# and the .NET Framework, Techmedia

Introduction to Machine Learning		Semester	V
Course Code	OBCD503	CIE Marks	
Teaching Hours/Week (L:T:P: S)		SEE Marks	
Total Hours of Pedagogy		Total Marks	
Credits	4	Exam Hours	
Examination nature (SEE)	Theory		

Course objectives:

1. Explain the concept of supervised, unsupervised and semi-supervised learning.
2. Develop algorithms to learn linear and non- linear models using software.
3. Perform creative work in the field ML to solve given problem.

MODULE-1

Introduction to Machine learning: Supervised learning, Unsupervised learning, some basic concepts in machine learning, Review of probability, The log-sum-exp trick, Feature selection using mutual information, Linear Regression

MODULE-2

Computational Learning theory- Sample complexity, ε- exhausted version space, PAC learning, agnostic learner, VC dimensions, Sample complexity. Bayesian Learning, curse of dimensionality, over fitting. Parametric Estimators - estimator bias and variance, active learning

MODULE-3

Dimensionality reduction, Clustering – choosing the number of clusters, Spectral clustering, Evaluating cluster quality. Margin and generalization (EM) algorithm, EM, regularization

MODULE-4

Non-parametric methods – KNN Linear discrimination - Support vector machine (SVM) and kernels, Classification errors, regularization, logistic regression.

MODULE-5

Model selection, Model selection criteria, Description length, feature selection, Combining classifiers, Bagging, boosting, Random Forest. Markov models, Hidden Markov models (HMMs), Bayesian networks, Learning Bayesian networks, Probabilistic inference, Current problems in machine learning.

Suggested Learning Resources:

Books

1. Kevin P. Murphey, ―Machine Learning, a probabilistic perspective‖, The MIT Press, 2012.
2. Tom Mitchael, ―Machine Learning‖, McGraw Hill, 1997.
3. Ethem Alpaydin,‖Introduction to Machine learning‖, PHI learning, MIT Press, 2010, 2nd edition
4. John D. Killeher, Brian Mac, Namee, AoiFE D'Arcy, Fundamental of Machine Learning for Predictive Data Analytics, 2015 MITpress
5. Alex Smola and SVN. Viswanathan, ―Introduction to Machine Learning‖, Cambridge University Press, 2008.

Introduction to Data Mining		Semester	V
Course Code	OBCD504	CIE Marks	
Teaching Hours/Week (L:T:P: S)		SEE Marks	
Total Hours of Pedagogy		Total Marks	
Credits	4	Exam Hours	
Examination nature (SEE)	Theory		

Course objectives:

- To inculcate in students different concepts of software engineering principles.
- To develop the skills necessary to design, develop and execute software projects.
- Learning Outcome On completion of the course the student will understand the importance of the stages in the software life cycle. Understand the various process models

MODULE-1

Introduction: Introduction to Data Mining-Types of Data and Patterns Mined-Technologies Applications-Major Issues in Data Mining. Introduction to Data Warehousing: Basic Concepts and Techniques

MODULE-2

Knowing about Data-Data Preprocessing: Cleaning– Integration–Reduction–Data Transformation and Discretization

MODULE-3

Mining Frequent Patterns: Basic Concept – Frequent Item Set Mining Methods -Apriori and FP Growth algorithms -Mining Association Rules

MODULE-4

Classification and Predication: Issues – Algorithms- Decision Tree Induction - Bayesian Classification –k Nearest Neighbor - Prediction - Accuracy- Precision and Recall

MODULE-5

Clustering: Overview of Clustering – Types of Data in Cluster Analysis – K Means and K Medoid, Hierarchical Clustering Algorithms

Suggested Learning Resources:

Books

1. Jiawei Han, Micheline Kamber and Jian Pei, —Data mining concepts and Techniques, Third Edition, Elsevier Publisher, 2006.
2. K.P.Soman, Shyam Diwakar and V.Ajay, —Insight into data mining Theory and Practice, Prentice Hall of India, 2006.
3. William H Inmon —Building the Data Warehouse, Wiley, Fourth Edition 2005.

.Net Lab		Semester	V
Course Code	**OBCD505**	**CIE Marks**	
Teaching Hours/Week (L:T:P: S)		**SEE Marks**	
Total Hours of Pedagogy		**Total Marks**	
Credits	**2**	**Exam Hours**	
Examination nature (SEE)	**Lab**		

1. Develop a C# .NET console application to demonstrate the conditional statements.
2. Develop a C# .NET console application to demonstrate the control statements.
3. Develop an application in C#.NET that demonstrates the windows controls
4. Demonstrate Multithreaded Programming in C#.NET
5. Demonstrate subroutines and functions in C#.NET
6. Write a program to reverse a given string using C#.
7. Using Try, Catch and Finally blocks write a program in C# to demonstrate error handling.
8. Design a simple calculator using Switch Statement in C#.
9. Demonstrate Use of Virtual and override key words in C# with a simple program
10. Implement linked lists in C# using the existing collections name space.
11. Write a program to demonstrate abstract class and abstract methods in C#.
12. Write a program to illustrate the use of different properties in C#.
13. Demonstrate arrays of interface types with a C# program.

Mini Project		Semester	V
Course Code	**OBCD506**	**CIE Marks**	
Teaching Hours/Week (L:T:P: S)		**SEE Marks**	
Total Hours of Pedagogy		**Total Marks**	
Credits	**2**	**Exam Hours**	
Examination nature (SEE)	**Lab**		

Data Scientists, employ techniques and theories drawn from many fields within the broad areas of mathematics, statistics, information science, and computer science, in particular from the subdomains of machine learning, classification, cluster analysis, data mining, databases, and visualization to derive actionable insights and help meet specific business needs and goals. The goal of this Mini Project course is to help the student apply the theories and important tools they studied in this program to practice data science and mobilize the students for the next semester Major Project.

Big Data		Semester	VI
Course Code	**OBCD601**	**CIE Marks**	
Teaching Hours/Week (L:T:P: S)		**SEE Marks**	
Total Hours of Pedagogy		**Total Marks**	
Credits	**4**	**Exam Hours**	
Examination nature (SEE)	**Theory**		

Course objectives:

1. Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing
2. Apply the fundamental concepts in data centres to understand the tradeoffs in power, efficiency and cost
3. Discuss system virtualization and outline its role in enabling the cloud computing system model
4. Illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as AmazonS3

MODULE-1

Introduction to Big Data, Types of Digital Data, Characteristics of Big Data, Evolution of Big Data, Definition of Big Data, Data Appliance, Challenges with Big Data, Big data sources, Best practices in Big Data Analytics, Introduction to Data Modelling.

MODULE-2

Introduction to elementary data analysis: Measures of center: Mean, Median, Mode, Variance, Standard deviation, Range, Normal Distribution : Center, Spread, Skewed Left, Skewed Right, Outlier, Correlation Patterns, Magnitude and Direction in relationship, Introduction to Bayesian Model

MODULE-3

History of Visualization, Goals of Visualization, Types of Data Visualization: Scientific Visualization, Information Visualization, Visual Analytics, Impact of visualization, Big Data Visualization Tools: Tableau, Google Chart.

MODULE-4

Introduction to Big Data Processing and Apache Hadoop, Installation and Configuration of Hadoop in Ubuntu, HDFS Concepts, MapReduce Framework, Anatomy of a Map Reduce Job Run, Job Scheduling, Shuffle and Sort, Task Execution.

MODULE-5
Introduction to Hadoop Eco System, Apache Hive, Apache Mahout, Apache Pig, Case studies: Analyzing big data with twitter, Big data for Ecommerce, Big data for blogs.

Suggested Learning Resources:

Books

1. Seema Acharya, Subhasini Chellappan, "Big Data Analytics", Wiley, 2015
2. Frank J Ohlhorst, —Big Data and Analytics: Turning Big Data into Big Money, Wiley and SAS Business Series, 2012.
3. Tom White, — Hadoop: The Definitive Guide Third Edition, O'reily Media, 2012.

Internship and Seminar		Semester	VI
Course Code	**OBCD602**	**CIE Marks**	
Teaching Hours/Week (L:T:P: S)		**SEE Marks**	
Total Hours of Pedagogy		**Total Marks**	
Credits	**04**	**Exam Hours**	
Examination nature (SEE)	**Lab**		

General Rules

1) All the students have to undergo mandatory internship of 4 weeks during the vacation of 5th semester to take up individual project in companies/respective Colleges at higher than the mini project standards already taken up during previous semesters.
2) Internship and seminar shall be considered as a head of passing and shall be considered for the award of degree.
3) Those, who do not take-up/complete the internship shall be declared as fail in internship course and have to complete the same during the subsequent semester.
4) After satisfying the internship requirements the degree will be awarded.
5) The student can present the progress about the internship and seminar to the committee at the department level.
6) The student has to submit a report about the outcome of the internship at the end of the semester along with the project report.
7) The internship and seminar report submitted by the student has to be evaluated by the guide concerned / a committee constituted by the head of the department.
8) The report shall be preserved at the department for future reference.

Project Work		Semester	VI
Course Code	**OBCD603**	**CIE Marks**	
Teaching Hours/Week (L:T:P: S)		**SEE Marks**	
Total Hours of Pedagogy		**Total Marks**	
Credits	**12**	**Exam Hours**	
Examination nature (SEE)	**Lab**		

- Project Guide Lines Maximum 2 students shall be allowed to take up a project.
- Each student will have to work for 12 hours per week whether in the college premises or outside.
- If a student opts for industrial outside project, a college teacher has to be an internal guide. In this case the student has to report/present his/her progress twice in a week.
- Guiding one project shall be considered as 4 hours of practical per week as the work load for hte concerned internal guide.
- Each student shall submit his/her project synopsis to the concerned guide within 15 days in consultation with internal guide from the commencement of the respctive semester.
- Each student has to carry out 2 project seminars compulsorily in project duration.
- Each seminar will be considered for thier internal assessment.