



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited A++ Grade by NAAC | 12B Status by UGC | Approved by AICTE

www.sathyabama.ac.in

School of Computing

Department of Computer Science & Engineering

1.1.3 Courses having focus on Employability / Entrepreneurship / Skill Development

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S11BLH11	PROGRAMMING IN C	L	T	P	EL	Credits	Total Marks
		2	0	4	0	4	100

COURSE OBJECTIVES

- To understand the concepts of variables, operators, control structures and arrays.
- To gain knowledge on functions, structures and union in C.
- To explore the concepts of pointers and files to create real world applications using C.

UNIT 1 BITS AND BYTES IN COMPUTING 12 Hrs.

Computers: Hardware - Software - Processor - Memory - I/O devices - Interface - Programming Languages - Evolution from COBOL, FORTRAN to C, Python - Need

Algorithms: Role in problem solving - Analysis - Design - Flowcharts: Role in problem solving - Symbols - Design - Pseudo code: Role in problem solving - Design - Program: Role in problem solving - Design

Practical:

- Describe a simple real world problem in your domain of interest and describe it in the form of problem statement, input, output and provide its solution in terms of algorithm, flowchart, pseudo code and program.

UNIT 2 C: MATH BEHIND CODING 12 Hrs.

C: Structure of program - Character set - Tokens - Keywords - Identifiers - Constants - Variables - Data types - Strings - Operators and its types - Functions - Header Files

Algorithmic Strategies: Iteration and Recursion - Efficiency - Role of time and space consumption while building an algorithm - Complexities

Practical:

- Describe a simple real world problem in your domain of interest and provide a computing and non-computing solution for the same. Calculate the time and space consumed in both solutions. Compare and contrast the pros and cons in both solutions.
- Write an algorithm, flowchart, pseudo code followed by a simple C code to do find the Factorial and Fibonacci series using both iteration and recursion.
- Input the number of days taken to cultivate both rice and wheat in turns in an agricultural land from the user. Write a C program to display the days as years, months and days using simple operators.
- You have a circular plot for building playground and a rectangular plot for building an apartment. Get the input from the user for both plots and write a C program to calculate the area and perimeter of both plots.

UNIT 3 C: MAGIC BEHIND INSTANT OUTPUTS 12 Hrs.

Advanced coding concepts: Decision Making using branching statements and its types - Decision making using looping statements and its types - Switch statements - Break - Continue - Goto - Jump statements.

Case Study: Fun with Code -- Printing Alphabets / Flags of Countries / Flying Alphabet Screensaver.

Practical:

- Describe a problem statement in your domain of interest whose solution involves repetition of same steps and provide code as solution involving for, while and do while loops.
- Describe a problem statement in your domain of interest whose solution involves decision making and provide code as solution involving if-else, nested if-else and ladder if-else.
- Develop a simple scientific calculator using Switch case statement.
- A Cartesian co-ordinate system has four quadrants. Write a C program to find the quadrant of the co-ordinate points given by the user using both if-else and nested if-else control structure.
- Given a rose flower to you, dismantle the petals of the flower from inside, if you notice - it

follows the sequence of Fibonacci. Now, try to arrange the word "PIZZA" in several ways without repeating and calculate number of ways it can be done using factorial concept. Write a C program to find both Fibonacci and factorial by getting the mentioned input.

1. Product of two large prime numbers is used as encryption key in encryption algorithms. Write a C program to display all the prime numbers between 1 to 100 and give the first two largest numbers as the output.

UNIT 4 STORING GROUP OF HOMOGENOUS ELEMENTS: ARRAYS 12 Hrs.

Diving into Arrays: Definition - Syntax - Types - Representation: Row and Column Order - Dynamic Arrays.

Idea behind functions: Declaration - Definition - Types - Calling - Arguments - Prototypes - Call by Value - Call by Reference - Pointers - Amalgamation of Pointers with Arrays and Strings.

Case Study: Fun with Code - Simple Game Development using Arrays and Functions.

Practical:

- Describe a problem statement in your domain of interest where you need to work with group of same type of data. Provide a solution in terms of C program to store and manage the data effectively.
- You're playing UNO cards, suddenly a person is getting rev card. Write a C program to reverse the round by storing the number of players in array.
- Write a C program for Vehicle Regulation System where odd number ending vehicles can use the road on odd days and even number ending vehicles can use the road on even days using two separate arrays to store and display the odd and even numbers.
- Write a C program to do the following applications in array:
 - a. (i). Get set of positive and negative integers from user, replace positive integers by 0 in the array.
 - b. (ii). Reverse the floating point numbers stored in the array.
 - c. (iii). Return the smallest value and largest value position in the array.
 - d. (iv). Search the number '5' in array and replace it with '10'
- Write C program to do the following string handling applications.
 - a. (i). Get favourite actor and actress name, concatenate it and display
 - b. (ii). Display your name in uppercase, lowercase and as fname and lname.
 - c. (iii). Count the frequency of "the" in any sentence and delete it from sentence.
 - d. (iv). Check whether the given string is a palindrome or not.
- Write a C program for counting the total number of duplicate elements in an array, print all the unique elements in the same array as two different functions.
- Write a C program to sort the elements in an array in both ascending and descending order using two different functions.
- Write a C program to find the largest and smallest number in an array using recursion and to convert the output into a binary number.
- Write a C program to swap two numbers using two functions, one using pointers and the other one without using pointers.

UNIT 5 STORING GROUP OF HETEROGENOUS ELEMENTS: STRUCTURE 12 Hrs.

Outset of Structure and Union: Structure definition and declaration - Structures fusion with Arrays - Pointers - Functions - Union initiation, Definition and declaration - Memory allocation- Static and dynamic Working with Files: File handling functions - Read - Write - Other operations - Different file types Case Study:

Report on using file functions to create score board for any game, importing it to program Practical:

- Describe a problem statement in your domain of interest where you need to work with group of different type of data. Provide a solution in terms of C program to store and manage the data effectively.

- Write a C program to get the details of the student (roll no, name, date of birth, state, 10th percentage and 12th percentage) using structure. Calculate the age of the student and display the eligibility status for his admission.
- a. Eligibility criteria: more than 60 percent in 10th and 12th, age $\geq$ 17, state==TN.
- Write a menu driven C program for library management system with ten entries:
 - (i). Add Book (ii). Add Author (iii). Add Category (iv). Book Cos
- (v). Display - Book by Author, Book by Category, Book under cost
- Write a C program to create an employee Union with employee details (id, name, salary) Accept the details of 'n' employees, rearrange the data in ascending order of employee name, id and salary as three different functions and display it.

Complex Practice Problems

- Design a C program by creating your own header file for any function of your choice and display the output by calling the header file.
- Create TIC-TAC-TOE game using C Language.
- Given a situation, you are going to ATM to withdraw money. Write a C program, get the money requested from the user as input and display the number of possible bank notes for the requested money. Note: Give input as number ending in 0's or 5's.
- Develop a C program for managing Car Rental process with various modules for registration as new user, login, get id proof, keep track of cars available and cars given for rental.
- Create SUDOKU game using C Language.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Interpret the difference between components of problem solving such as algorithm, flowchart, pseudo code and source code.

CO2 - Build simple solutions for any given problem statement using various components of problem solving techniques and measure its efficiency in terms of time and space.

CO3 - Examine the roots and foundation of C programming's key concepts like Data types, Operators.

CO4 - Design applications using different core concepts such as Arrays and Functions in C language.

CO5 - Formulate real time solutions through programs using Structure and Union in C language.

CO6 - Develop various applications for solving real time societal problems.

TEXT / REFERENCE BOOKS

1. Yashavant Kanetkar, "Let us C", BPB Publications, 14th Edition, 2019.
2. R.G.Dromey, "How to Solve it by Computer", Pearson Education, 2008..
3. Balagurusamy, "Programming in ANSI C", McGraw Hill Publications, 8th Edition, 2019.
4. Greg Perry, Dean Miller "C Programming Absolute Beginner's Guide", 3rd Edition, 2013.

 - Employability

SCSB1201	DATA STRUCTURES	L	T	P	EL	Credits	Total Marks
		3	1	0	0	3	100

COURSE OBJECTIVES

- To understand concepts of linked list, searching and sorting techniques.
- To implement basic concepts of stacks and queues.
- To develop the ability to solve problems by choosing and applying the right data structures.

UNIT 1 INTRODUCTION

9 Hrs.

Introduction to Data Structures - Need - Classification-Arrays - Singly linked list - Representation of a linked list in memory - Operations on a singly linked list - Merging two singly linked lists into one list - Reversing a singly linked list -Advantages and disadvantages of singly linked list - Circular linked list - Doubly linked list.

UNIT 2 STACK AND QUEUE

9 Hrs.

Basic Stack Operations - Representation of a Stack using Arrays - Algorithm for Stack Operations - Infix to postfix Transformation - Evaluating Arithmetic Expressions.

Basic Queue Operations - Representation of a Queue using array - Enqueue - Dequeue - Circular Queues - Priority Queues.

UNIT 3 TREES

9 Hrs.

Trees- Binary Trees - Properties of Binary trees -Implementation using Array and Linked list - Recursive and Non-Recursive Binary Tree traversals - Binary Search Tree - Insertion and Deletion

UNIT 4 GRAPHS

9 Hrs.

Graph - Representation using Array and Linked List - Types of graphs - Graph traversals - BFS and DFS -Minimum Spanning Tree - Kruskal's, Prim's Algorithm - Shortest path using Dijkstra's, Bellman Ford and Floyd Warshall Algorithm.

UNIT 5 SEARCHING AND SORTING TECHNIQUES

9 Hrs.

Basic concepts - List Searches using Linear Search - Binary Search - Fibonacci Search - Sorting Techniques - Insertion sort-Heap sort - Bubble sort - Quick sort - Merge sort - Analysis of sorting techniques.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Comprehend the concepts of data structures and choose the appropriate data structure to the problem definition.

CO2 - Design applications of linear data structures.

CO3 - Apply appropriate algorithms for solving problems like sorting, searching.

CO4 - Implement the various non-linear data structures and perform the intended operations. **CO5**

- Demonstrate the representation and traversal techniques of graphs and their applications. **CO6** -

Apply the learned algorithm, data structures to solve problems.

TEXT / REFERENCE BOOKS

1. Jean-Paul Tremblay, Paul G. Sorenson, "An Introduction to Data Structures with Application", TMH, 2017.
2. Richard F. Gilberg, Forouzan, "Data Structures", Cengage, 2004, 2nd Edition.
3. Larry R. Nyhoff, "ADTs, Data Structures, and Problem Solving with C++", Pearson Education, 2009.
4. Thomas H. Cormen, Charles E. Leiserson, "Introduction to Algorithms", MIT Press, 4th Edition, 2022.
5. Goodrich MT, Tamassia R, Goldwasser MH., "Data structures and Algorithms in Python", John Wiley and Sons Ltd; 2013.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 Questions of 2 marks each-No choice****20 Marks****PART B : 2 Questions from each unit with internal choice, each carrying 16 marks****80 Marks** - Employability

S11BLH21	PROGRAMMING IN PYTHON	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To learn data structures concepts like lists, tuples, and dictionaries in Python.
- To build packages with Python modules for reusability and handle user/custom exceptions.
- To create real world GUI applications, establish database connectivity and networking.

UNIT 1 INTRODUCTION TO PYTHON

12 Hrs.

History of Python- Introduction to the IDLE interpreter (shell) - Data Types - Built-in functions - Conditional statements - Iterative statements- Input/output functions - Python Database Communication - Data analysis and visualization using Python.

Practical:

- Implement built-in functions and trace the type of data items.
- Implement concepts of Conditional and Iterative Statements.
- Use the built-in csv module to read and write from a CSV file in Python.
- Perform data analysis and visualization on a given dataset using Python libraries like pandas, numpy, matplotlib and display charts, graphs, and plots.

UNIT 2 OBJECT ORIENTED CONCEPTS

12 Hrs.

Class - Objects - Constructors - Polymorphism - Encapsulation -Inheritance -Data Abstraction-Method Overloading-Method Overriding-Database Access-Data Hiding-Import Class.

Practical:

- Execute concepts on Polymorphism, Encapsulation.
- Implement Data Abstraction and Inheritance.
- Differentiate Method Overloading and Overriding.
- Create a class called "Person" with attributes "name" and "age." Make the "age" attribute private and implement a getter method to access it.
- Create a module called "math_operations.py" with a class called "Calculator." Import the "Calculator" class into another script and use its methods to perform mathematical operations.

UNIT 3 FILES AND EXCEPTIONS HANDLING, MODULES, PACKAGES

12 Hrs.

File Operations -Iterators - Exception handling - Regular Expressions- Functions and modules-Import Statement Introduction to PIP-Installing Packages via PIP-Using Python Packages.

Practical:

- Create a text file called "numbers.txt" and write the numbers from 1 to 10 in words, each on a separate line.
- Implement a custom iterator that generates a sequence of Fibonacci numbers and print the first 10 numbers.
- Create a try-except block to catch a File Not Found Error and print a message when a file is not found.
- Write a Python program that handles a Zero Division Error and prints a custom error message to the console.
- Create a module called "greetings.py" with a function called "hello" that prints "Hello, World!" Import the module into another script and use the "hello" function.
- Install the numpy package using PIP, import the package and create a numpy array with random values.

UNIT 4 GUI PROGRAMMING**12 Hrs.**

GUI programming in Python - Introduction to GUI library - Layout management - Events and bindings - Fonts - Colors - Canvas - Widgets (frame, label, button, check box, entry, list box, message, radio button, text, spin box).

Practical:

- Design a GUI form with a vertical box layout that includes labels and entry fields for user registration information.
- Create a GUI window with a grid layout that contains buttons representing a 3x3 game board.
- Create a canvas in your GUI program and draw simple shapes such as rectangles, circles, and lines.
- Create a GUI form program that includes various widgets and implement event handling Concepts also add Create a drop-down menu that allows users to select different font styles for text display.

UNIT 5 DATABASE AND NETWORK**12 Hrs.**

Database (using NoSQL): Connector Module -Cursor - Statements - Exceptions in database. Network connectivity: Socket module - Client - Server -Email - URL Access.

Practical:

- Connect to the NoSQL database using a Python connector module, such as "pymongo" for MongoDB or "cassandra-driver" for Cassandra.
- Use a cursor to iterate over the records in a collection/table and print specific fields/attributes.
- Implement error handling for specific scenarios, such as duplicate key violation or record not found, in the NoSQL database.
- Implement either a TCP/IP or UDP client-server application using the socket module for sending and receiving messages.
- Write a program using the smtplib module to send an email from a specified email address to another recipient.

Max. 60 Hrs.**COURSE OUTCOMES**

On Completion of the course the student will able to

CO1 - Describe the numbers, math functions, strings, list, tuples and dictionaries in Python. **CO2**

- Develop simple applications in Python using object oriented programming concepts. **CO3** - Design GUI applications in Python and evaluate different database operations.

CO4 - Design client server network applications using Python.

CO5 - Design solutions to real life problems.

CO6 - Apply the best features of mathematics, engineering and natural sciences to program real life problems.

TEXT / REFERENCE BOOKS

1. R. Nageswara Rao , "Core Python Programming", Dreamtech Press, 3rd Edition, 2021
2. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, 2013.
3. Python Notes for Professionals by Stack Overflow Documentation (<https://books.goalkicker.com/PythonBook/>).
4. Dr. Charles R. Severance, "Python for Everybody- Exploring Data Using Python 3", 2016.
5. Paul Gries, Jennifer Campbell, Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Pragmatic Bookshelf, 2nd Edition, 2014.

- Employability

SCSB2201	DATA STRUCTURES LAB	L	T	P	EL	Credits	Total marks
		0	0	4	0	2	100

SUGGESTED LIST OF EXPERIMENTS

1. In a marketplace, there are multiple places that sell pineapple at different size and cost. Implement a program to find the place that sells quality pineapple with largest size and minimum cost by getting the size and cost in array.
2. To use undo operation in a Microsoft Word, the machine needs to remember the list of states and operations made. To implement this in real time write a detailed program with set of insertion and deletion operation functions.
3. Spotify app uses playlist where the song can be changed in both directions to play the next and previous songs in the list. To implement this concept in real time write a detailed program with set of insertion and deletion operation functions.
4. Implement the problem of Towers of Hanoi - a critically acclaimed mathematical implementation with the use of Stack data structure. Implement all of its operation.
5. To manage the queuing system of ticket counter in SKY cinemas implement the queue data structure with all of its corresponding operations.
6. To organize a traffic light management system based on number of vehicles on each side, implement a circular queue data structure algorithm along with its respective operations.
7. Get a complex expression from the user in human's understandable BODMAS format and convert the same expression into machine readable form.
8. To sort the contact names in your phone in ascending order based on the first name using insertion sort algorithm.
9. To sort the students in the class according to their heights for group photo in descending using quick sort algorithm.
10. To sort the chocolates in the supermarket based on its cost and size in ascending order using merge sort algorithm.
11. Implement the Linear Search and Binary Search methods in two programmes to discover any given element inside the provided range of numbers, and compare the results to determine which algorithm is faster and/or uses less space.
12. Write a programme to visit every restaurant along the route when travelling from Chennai to Pondicherry through creating a binary tree for the purpose.
13. Write a program
 - a. To find the nearest restaurants from your location by implementing Breadth First Search traversal algorithm.
 - b. Implement the Depth First Search traversal algorithm to find the cycles in any given graph.
14. By applying the minimal spanning tree technique, you can implement an intercom system to connect all the departments in your college with the least amount of wiring.
15. Implement any shortest path algorithm to discover the shortest route between Chennai and Hyderabad.

COURSE OUTCOMES

On completion of the course, student will be able to

- C01** - Implement programs using array and linked list data structures by mapping it to daily pursuits.
- C02** - Formulate programs for algorithms based on stack and queue data structure and its application.
- C03** - Demonstrate the process of sorting that happens in daily activity by implementing various sorting algorithms.
- C04** - Compare and contrast the difference in time and space complexity for Linear and Binary search algorithm.
- C05** - Develop graph and tree traversal algorithms for real time application.
- C06** - Design shortest path finding algorithms for real time societal problems.

SITA1301	PROGRAMMING IN JAVA	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To introduce Object Oriented concepts in Java.
- To understand Packages, Interfaces and Multithreading Concepts.
- To understand lang, io packages.
- To understand the concepts involved internet application development.
- To understand the internet application design using swing controls.

UNIT 1 INTRODUCTION TO JAVA

9 Hrs.

Classes and Objects – Class Fundamentals – Declaring Objects – Methods – Constructors – Garbage Collection. Inheritance – Basics – Using Super – Method Overriding – Abstract Classes – Using final with inheritance. String Handling – String class – String buffer class.

UNIT 2 PACKAGES, INTERFACES AND THREADS

9 Hrs.

Introduction to Packages – User Defined Packages - Importing packages – Access protection – Interfaces – Exception Handling - Exception Types – Using try, catch, throw, throws and finally –Multithreading – Java Thread Model – Main thread – Creating multiple thread – Thread priorities – Synchronization.

UNIT 3 LANG AND IO PACKAGES

9 Hrs.

Java. lang package - Wrapper Classes– Simple type wrappers – Using clone() and the Cloneable Interface -IO Package - Introduction – Input Stream and Output Stream classes - Data Output Stream and Data Input Stream classes –FileInput Stream – File Output Stream. - Reader and Writer Classes – File Reader and File Writer.

UNIT 4 APPLLET PROGRAMMING AND EVENT HANDLING

9 Hrs.

Applet Class – Applet basics – HTML APPLLET tag – Passing parameters to applets -Delegation Event Model – Handling Mouse and Keyboard Events – Adapter Classes.

UNIT 5 SWINGS AND DATABASE CONNECTIVITY

9 Hrs.

Introduction - JApplet Class- JLabel Control - JTextField Control –JButton Control –JCheckbox Control-JRadioButton Control – J ComboBox Control – JtappedPane Control-J ScrollPane Control - JTable. Introduction –Establishing Connection – Creation of Data Tables – Entering Data into the Tables- Table Updating.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Develop application programs using java object oriented concepts.
- CO2 - Implement the interface, package and multithread concepts.
- CO3 - Implement various built in packages and its applications.
- CO4 - Develop web based applications using applet programming.
- CO5 - Implement Swing concepts in real time applications.
- CO6 - Design the internet applications frontend and connect with backend using database connectivity.

TEXT / REFERENCE BOOKS

1. Herbert Schildt , "The Complete Reference JAVA2", 5th Edition, Tata McGraw Hill, 2017.
2. Bruce Eckel , "Thinking in Java", Pearson Education, 4th Edition 2006.
3. Core Java Volume-I Fundamentals, 9th Edition, Cay Horstman and Grazy Cornell, Prentice Hall, 2013.
4. <https://docs.oracle.com/javase/tutorial/>.
5. <https://www.tutorialspoint.com/java/>.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

PART A : 10 Questions of 2 marks each-No choice

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks

Exam Duration : 3 Hrs.

20 Marks

80 Marks

 - Employability

SCSA1301	DATABASE MANAGEMENT SYSTEMS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand terms related to database design and management.
- To gain knowledge in relational model and relational database management system.
- To implement relational databases using SQL & My SQL.
- To understand database security and performance issues.
- To understand the basics of Data warehousing and Data mining.

UNIT 1 INTRODUCTION TO DATABASES

9 Hrs.

Databases and database users – Database system concepts and architecture – Data modeling using entity Relationship(ER) model – Enhanced ER model- Relational Model - The Relational Data Model and Relational Database Constraints - The Relational Algebra and Relational Calculus.

UNIT 2 DATABASE DESIGN

9 Hrs.

Overview of the Hierarchical Data Model - Overview of the Network Data Model – Relational database design: Mapping ER Model to Relational Model - Commercial query languages: QBE – Functional dependency – Normalization.

UNIT 3 QUERY PROCESSING

9 Hrs.

SQL Queries -Embedded SQL -My SQL: Basics, Queries in MySQL and Algorithms for Query Processing and Optimization - Introduction to Transaction Processing Concepts and Theory - Concurrency control techniques.

UNIT 4 RECOVERY AND SECURITY

9 Hrs.

Database Recovery Techniques - Database Security – Debate on the distributed databases and Client- Server Architecture with reference to Indian Railway Reservation System.

UNIT 5 OBJECT DATABASE AND CURRENT TRENDS

9 Hrs.

Concepts for Object Database - **Emerging Database Technologies and Application - Introduction to Data warehousing & Data mining –Applications of Data mining.**

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Design ER-models to represent simple database application scenarios.
- CO2 - Ability to understand and design data modelling using Entity-Relationship model.
- CO3 - Implement SQL to a broad range of query and data update problems.
- CO4 - Articulate socio-economic applications of distributed databases and use database recovery mechanisms.
- CO5 - Familiar with data warehousing and data mining applications.
- CO6 - Apply Normalization techniques to normalize and improve the database design.

TEXT / REFERENCE BOOKS

1. Elmasri & Navathe, "Fundamentals of Database Systems", 6th Edition, Addison Wesley, 2011.
2. Abraham Silberschatz, Henry.F.Korth and S.Sudharshan, "Database System Concepts", 4th Edition, 2002.
3. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", 3rd Edition, Elsevier, 2012.
4. Jan L. Harrington, "Object oriented database design", Harcourt India private limited 2000.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 Questions of 2 marks each-No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks

80 Marks

 - Employability

SCSA1302	THEORY OF COMPUTATION	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To introduce Automata Theory and Regular Languages.
- To understand Context Free languages and recognizers for different languages.
- To design Turing Machines for various languages.
- To understand the concepts involved in software development.
- To gain knowledge on undecidable problems.

Finite automata and regular languages - Regular languages and regular expressions - Finite automata -Non-determinism and Kleene's theorem - Non-deterministic finite automata and NFA with null transition.

UNIT 2 CONTEXT-FREE LANGUAGES AND NORMAL FORMS

9 Hrs.

Context-free grammars - Definition - More examples - Union, concatenations, and *'s of CFLs - Derivation trees and ambiguity - Unambiguous CFG for algebraic expressions - Normal Forms - CNF – GNF.

UNIT 3 PUSH DOWN AUTOMATA

9 Hrs.

Pushdown automata - Introduction - Definition - Deterministic pushdown automata - PDA corresponding to a given context-free grammar – Context-free Grammar corresponding to PDA. Pumping Lemma for CFG.

UNIT 4 TURING MACHINES

9 Hrs.

Turing machines - Models of computation and the Turing thesis - Definition of TM and TM as language acceptor - Non-deterministic TM and Deterministic TM – Universal TM.

UNIT 5 RECURSIVE LANGUAGES AND UNDECIDABILITY

9 Hrs.

Recursively enumerable and recursive languages – Properties of Recursively enumerable and recursive languages - Enumerating a language. Introduction to Undecidability- Halting problem-Undecidability of Post correspondence problem (PCP)-Modified PCP -Rice Theorem.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Identify, analyze and compute a solution to a problem.
- CO2 - Interpret data using computational theory.
- CO3 - Determine whether a language is context free or not.
- CO4 - Design a Turing Machine for a given problem.
- CO5 - Apply the theoretical knowledge the design of compilers.
- CO6 - Identify the limitations of some computational models.

TEXT / REFERENCE BOOKS

1. Introduction to Languages and the Theory of Computation, John. C. Martin, Tata McGraw-Hill, 2003.
2. Introduction to Automata Theory, Languages and Computation, Hopcroft, Motwani, and Ullman, Pearson Publishers, 3rd Edition, 2006.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

PART A : 10 Questions of 2 marks each-No choice

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks

Exam Duration : 3 Hrs.

20 Marks

80 Marks

- Employability

SCSA1303	SOFTWARE ENGINEERING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- Software process models and compare their applicability.
- Identify the key activities in managing a software project.
- Concepts of requirements engineering and Analysis Modelling.
- Apply systematic procedure for software design and deployment.
- Compare and contrast the various testing and maintenance.

UNIT 1 SOFTWARE PROCESS AND PROJECT MANAGEMENT

9 Hrs.

The evolving role of software – the changing nature of software- Life cycle models - Water fall - Incremental - Spiral - Evolutionary - Prototyping – Concurrent development – Specialised process models - Verification - Validation - Life cycle process - Development process - System engineering hierarchy - Introduction to CMM - Levels of CMM.

UNIT 2 REQUIREMENT ANALYSIS AND SPECIFICATIONS

9 Hrs.

Functional and Non-Functional - User - System - Requirement Engineering Process - Feasibility Studies –communication practices- Requirements - Elicitation - Validation and management - Fundamental of requirement analysis – Analysis principles – Structured System Analysis - Software prototyping - Prototyping in the Software Process - Data - Functional and Behavioral Models - Structured Analysis and Data Dictionary.

UNIT 3 SOFTWARE DESIGN

9 Hrs.

Design process - Modular design - Design heuristic - Design model and document - Architectural design - Software architecture - Data design - Architecture data - Transform and transaction mapping - User interface design - User interface design principles.

Levels - Software Testing Fundamentals - Types of s/w test - White box testing- Basis path testing - Black box testing - Control Structure testing- Regression testing strategies - Strategic approach and issues - UNIT testing - Integration testing - Validation testing - System testing and debugging. Case studies - Writing black box and white box testing-Coding Practices-Refactoring.

UNIT 5 PROJECT MANAGEMENT AND ESTIMATION

9 Hrs.

Software cost estimation - COCOMO model - Quality management - Quality concepts- SQA - Software reviews - Formal technical reviews - Formal approaches of SQA and software reliability - Software maintenance - SCM - Need for SCM - Version control - Introduction to SCM process - Software configuration items. Re-Engineering - Software reengineering - Reverse engineering - Restructuring - Forward engineering.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Identify and apply software lifecycle model for a given problem and will know the criteria for each level of CMM.
- CO2 - Comprehend types of requirements and summarize Requirement Engineering Process.
- CO3 - Design data, functional and behavioral model for any given software requirement.
- CO4 - Identify and analyze levels of testing and perform white box testing and black box testing for a given problem.
- CO5 - Describe concepts of software quality assurance and software configuration management.
- CO6 - Compare and contrast forward engineering, reverse engineering and reengineering.

TEXT / REFERENCE BOOKS

1. Pressman, "Software Engineering and Application", 7th Edition, McGraw International Edition, 2009.
2. Ian Sommerville, "Software Engineering", 8th Edition, Pearson Education, 2008.
3. Stephan Schach, "Software Engineering", Tata McGraw Hill, 2007.
4. Pfleeger and Lawrance, "Software Engineering: Theory and Practice" Pearson Education, 2nd Edition, 200.1
5. Rajib Mall, "Fundamentals of Software Engineering", 3rd Edition, PHI Learning Private Limited, 2009.
6. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
7. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 2007.

- Employability

SCSA1304	ADVANCED DATA STRUCTURES	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To acquire knowledge of organizing the data in non linear fashion.
- To get the idea of balancing the height of trees to optimize the structure and search time.
- To learn the process of establishing the network with various nodes with minimum cost and finding the shortest path.
- To understand the method of designing the table data structure and its applications.

UNIT 1 BASIC TREE CONCEPTS

9 Hrs.

Trees- Ordinary and Binary trees terminology, Properties of Binary trees, Implementation using Array and Linked list - Binary tree ADT representations, recursive and non recursive traversals - Binary Search Tree - Insertion and Deletion.

UNIT 2 ADVANCED TREE CONCEPTS

9 Hrs.

Threaded Binary Trees, AVL Tree, B-tree Insertion and deletion, Splay trees - Heap trees - Heapify Procedure, Tries.

UNIT 3 GRAPH CONCEPTS

9 Hrs.

Terminology, Representation using Array and Linked List - Types of graphs - Graph traversals - BFS and DFS - Applications.

UNIT 4 ADVANCED GRAPH CONCEPTS

9 Hrs.

Minimum Spanning Tree - Kruskal's, Prim's and Sollin's Algorithm - Shortest path using Dijkstra's, Bellman Ford and Floyd Warshall Algorithm.

UNIT 5 TABLES AND SETS

9 Hrs.

Rectangular tables - Jagged tables - Inverted tables - Symbol tables - Static tree tables - Dynamic tree tables - Hash tables. Sets: Representation - Operations on sets - Applications.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Design and implement the various non-linear data structures and perform the intended operations.

CO2 - Understand the strength of balancing the height of the trees.

CO3 - Analyze the time complexity of various non linear data structures.

CO4 - Apply the algorithms to find the shortest path & to connect the nodes with minimum cost.

CO5 - Design the table and applying the table for many applications.

CO6 - Compare and identify the usage of different data structures.

TEXT / REFERENCE BOOKS

1. Ellis Horowitz and Sartaj Sahni "Fundamentals of Data Structures" Galgotia Book Source, Pvt. Ltd., 2004.
2. M. A. Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2005.
3. Jean Paul Tremblay and Paul G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw-Hill, 2nd edition, 2001.
4. Aaron M Tanenbaum, Moshe J Augenstein and Yedidyah Langsam, "Data Structures using C and C++", Pearson Education, 2004.
5. V. Aho, J.E. Hopcroft, and J.D. Ullman, "Data Structures and Algorithms", Pearson Education, 1st Edition Reprint 2003.
6. R. F. Gilberg, B. A. Forouzan, "Data Structures", 2nd Edition, Thomson India Edition, 2005.

 - Employability

SIT A2302	PROGRAMMING IN JAVA LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To implement Object Oriented concepts in Java
- To implement Packages, Interfaces and Multithreading Concepts.
- To develop applications using lang and io packages.
- To design web based application.
- To design GUI application design using swing controls.

CYCLE -1

1. Write a Java program using Classes and Objects.
2. Write a java Program using various types of Constructors.
3. Implement the concept of following kinds of Inheritance for Employee
 - Application 3.1. Single Inheritance.
 - 3.2. Multilevel Inheritance.
 - 3.3. Hierarchical
4. Write a Java Program to access various members of super class using Super Keyword
5. Write a java program that illustrates the example for abstract class.
7. Write a java program to find area of various shapes using interface.
8. Write a java Program to create custom package to implement calculator
9. Write a java program that describes the exception handling mechanism.
10. Write a java program that describes the user defined exception.
11. Write a program to create thread by extending Thread Class or by implementing Runnable Interface.
12. Write a java program to create copy of a given object using ICloneable interface.

CYCLE -2

13. Write a Java Program to implement Wrapper classes and their methods.
14. Write a java program for handling input and output operations using,
 - a. Input Stream and Output Stream classes
 - b. Reader and Writer Classes
 - c. Data Output Stream and Data Input Stream classes.
15. Write a java program that describes the life cycle of an applet.
16. Write a java program to pass parameters to Applet and display the output.
17. Write a java program for event handling using awt controls
18. Write a Java program to handle Mouse and Key events
19. Create a Java Application Programming Interface by using swing controls
20. Write a java program for database connectivity using JDBC.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1: Ability to implement application programs using java object oriented concepts
- CO2: Able to implement interface, package and multithread concepts
- CO3: Understand various built in packages and its applications
- CO4: Knowledge on designing web based applications using applet programming
- CO5: Create applications using Swing controls in real time applications.
- CO6: Able to connect frontend and backend using database connectivity.

SCSA1319	DESIGN THINKING AND INNOVATIONS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To introduce the idea of Human-centered design and design thinking.
- To understand the concept of empathy and its technique.
- To understand observation phase and insight concepts in design thinking.
- To leverage the use of prototype in design thinking
- To design business models using the design thinking innovations.

UNIT 1 HUMAN-CENTERED DESIGN

9 Hrs.

Introduction to Human-centered Design – Applications of Human-centered Design – Design Process – Mindsets of Human-centered designer – Principles and process of Design Thinking – Planning a Design Thinking Project

UNIT 2 INTERVIEWING & EMPATHY-BUILDING TECHNIQUES

9 Hrs.

Introduction to Empathy – Practicing Empathy – Empathy vs. Sympathy – Methods for Empathetic design – Tips for Interviews – Empathy Interviews – Understanding and defining the problem

UNIT 3 MAKING SENSE OF OBSERVATIONS & INSIGHTS

9 Hrs.

Observation Phase – Tips for observing – Insights definition – Problems with Insights – Case study: Insight problems in the history of aviation – Creativity process, principles and techniques – Evaluation of ideas

UNIT 4 DEVELOPING AND TESTING PROTOTYPES

9 Hrs.

Role of Prototype in design thinking – Types of prototyping – Guidelines for prototyping – Lean Startup Method for Development – Visualization and presentation techniques – Testing prototypes: Feedbacks and Maximize learning

UNIT 5 DEFINING & TESTING BUSINESS MODELS & BUSINESS CASES

9 Hrs.

Business Model Definition – Design thinking to design business model – Innovation in Business Model – Pursuing innovation in business – Business model innovations cases – Kano Model – Desirability Testing.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1: Understand and apply human-centered design process and planning of design thinking project

CO2: Use empathetic design in the interview process

CO3: Identify need for observations and insights problems and come up with creative ideas in design thinking

CO4: Understand, build and test the prototypes

CO5: Use design thinking concepts to build successful business models.

CO6: Implement innovation techniques in business models.

TEXT /REFERENCE BOOKS

1. Mueller-Roterberg, Christian. "Handbook of Design Thinking." Hochschule Ruhr West (2018).
2. Design Kit by IDEO.org. "The field guide to human centered design." (2015), ISBN: 978-0-9914063-1-9.
3. <https://www.interaction-design.org/literature/article/design-thinking-getting-started-with-empathy>
4. <https://www.interaction-design.org/literature/article/stage-4-in-the-design-thinking-process-prototype>
5. <https://www.interaction-design.org/literature/article/test-your-prototypes-how-to-gather-feedback-and-maximise-learning>
6. <https://uxplanet.org/what-are-insights-aa1f2d1b3b9c>
7. <https://labs.sogeti.com/using-design-thinking-to-design-business-models/>
8. <https://www.northeastern.edu/graduate/blog/implementing-business-model-innovation/>

 - Entrepreneurship

SCSA2301	DATABASE MANAGEMENT SYSTEMS LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To instill sound understanding on the fundamentals of DBMS.
- To lay a formal foundation on the relational model.
- To introduce the basic concepts of SQL as a universal database language.
- To understand the necessity for normalization.
- To formulate problem statements for real life problems.

SUGGESTED LIST OF EXPERIMENTS

1. Data Definition Language(DDL).
2. Data Manipulation Language(DML).
3. Data Control Language(DCL).
4. Constraints and Built-in functions.
5. Joins and Group-by functions.
- 6.
- 7.
8. PL/SQL programs using triggers.
9. Developing GUI applications using PHP.
 - Student Information System.
 - Inventory Management.
- 10.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand, appreciate and effectively explain the underlying concepts of database technologies.

CO2 - Populate and query a database using SQL DML/DDDL commands.

CO3 - Declare and enforce integrity constraints on a database.CO4

- Retrieve data from multiple tables.

CO5 - Programming PL/SQL including stored procedures, stored functions, triggers.

CO6 - Design and build a GUI application using PHP.

 - Skill Development

SCSA1401	OBJECT ORIENTED ANALYSIS AND SYSTEM ENGINEERING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the fundamentals of Object Oriented System Development.
- To understand the object oriented methodologies.
- To use UML in requirements elicitation and designing.
- To understand concepts of relationships and aggregations.
- To test the software against its requirements specification.

UNIT 1 AN OVERVIEW OF OBJECT ORIENTED SYSTEM DEVELOPMENT

9 Hrs.

Introduction - Object Oriented System Development Methodology - Why Object Orientation - Overview of Unified Approach - Object Basics: Object Oriented Philosophy - Objects - Classes - Attributes - Object Behavior and Methods, Messages and Interfaces, Encapsulation and Information Hiding - Class Hierarchy - Polymorphism - Object Relationships and Associations - Aggregations and Object Containment - Object Identity - Static and Dynamic Binding - Persistence. Object-oriented CASE tools, Object Oriented Systems Development Life Cycle: Software Development Process - Building High Quality Software - Use case Driven Approach – Reusability.

UNIT 2 OBJECT ORIENTED METHODOLOGIES

9 Hrs.

Rumbaugh et al.'s Object Modeling Technique - Booch Methodology - Jacobson et al. Methodologies – Patterns - Framework - Unified approach - Unified Modeling Language: Static and Dynamic Model - UML Diagrams - UML Class Diagram – UML Use Case –Case study- Use case Modelling – Relating Use cases – include, extend and generalization – When to use Use-cases- UML Dynamic Modeling –Case study- UML Extensibility - UML Metamodel.

UNIT 3 OBJECT ORIENTED ANALYSIS

9 Hrs.

Business Object Analysis - Use Case Driven Object Oriented Analysis - Business Process Modeling - Use Case model - Developing Effective Documentation - Object Analysis Classification: Classification Theory - Noun Phrase Approach - Common Class Patterns Approach - **Use-Case Driven Approach** - Classes Responsibilities and Collaborators - Naming Classes - Identifying Object Relationships, Attributes and Methods: Association – SuperSubclass Relationships - A-part of Relationships.

UNIT 4 OBJECT ORIENTED DESIGN

9 Hrs.

Object Oriented Design Process - Object Oriented Design Axioms - Corollaries - Designing Classes: Object Constraint Language - Process of Designing Class - Class Visibility - Refining Attributes - Access Layer: Object Store and Persistence - Database Management System - **Logical and Physical Database Organization and Access Control** - Distributed Databases and Client Server Computing - Object Oriented Database Management System – Object Relational Systems - Designing Access Layer Classes -
of View Layer Interface - Prototyping the user interface.

UNIT 5 SOFTWARE QUALITY

9 Hrs.

Software Quality Assurance- Impact of Object Orientation on Testing - Develop Test Cases and Test Plans - System Usability and Measuring User Satisfaction: Usability Testing - User Satisfaction Testing.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand the basics object model for System development.
- CO2 - Understand the object Oriented Methodologies.
- CO3 - Express software design with UML diagrams.
- CO4 - Understand the concept of Relationships.
- CO5 - Design software applications using OO concepts.
- CO6 - Understand the various testing methodologies for OO software.

TEXT / REFERENCE BOOKS

1. Ali Bahrami, "Object oriented systems development using the unified modelling language", McGraw- Hill.
2. Grady Booch, James Rumbaugh, and Ivar Jacobson, "The Unified Modeling Language User Guide", 3rd Edition Addison Wesley.
3. John Deacon, "Object Oriented Analysis and Design", 1st Edition, Addison Wesley.
4. Bernd Oestereich, "Developing Software with UML, Object - Oriented Analysis and Design in Practice", Addison-Wesley.

Employability

SCSA1402	COMPUTER ARCHITECTURE AND ORGANIZATION	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To impart knowledge on various types of Registers and Microinstructions.
- To discuss about the Data path design and Processor design in detail.
- To understand the types of memory organizations.
- To discuss about the registers, interface and communication in I/O devices.
- To analyze about the characteristics, structure, communication and synchronization of multiprocessors.

UNIT 1 CENTRAL PROCESSING UNIT

9 Hrs.

Introduction - General Register Organization - Stack organization - Basic computer Organization - Instruction codes - Computer Registers - Computer Instructions - Instruction Cycle - Arithmetic – Logic - Shift Micro operations - Arithmetic Logic Shift unit - Example Architectures: MIPS – Power – PC – RISC – CISC.

UNIT 2 COMPUTER ARITHMETIC

9 Hrs.

Addition - Subtraction - Multiplication and Division algorithms - Floating Point Arithmetic operations Micro programmed Control - Control memory - address sequencing – Micro program Example - Design of Control unit - Example Processor design.

UNIT 3 MEMORY ORGANIZATION

9 Hrs.

Memory Hierarchy - Main memory - auxiliary Memory - Associative Memory - Cache Memory - Virtual memory.

UNIT 4 INPUT - OUTPUT ORGANIZATION

9 Hrs.

Peripheral Devices - I/O Interface - Modes of transfer - Priority Interrupt - DMA - IOP - Serial Communication.

UNIT 5 CHARACTERISTICS OF MULTIPROCESSORS

9 Hrs.

Interconnection Structures - Interprocessor Arbitration - Interprocessor Communication and Synchronization - Cache coherence.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Classify the various types of registers, microinstructions and addressing modes.

CO2 - Design the data path for processor.

CO3 - Demonstrate the usage of Memory Organization.

CO4 - Describe about the I/O devices.

CO5 - Explain the characteristics, structure, communication and synchronization of multiprocessor.

CO6 - State the inter processor communication and synchronization.

TEXT / REFERENCE BOOKS

1. M.Morris Mano, "Computer system Architecture", 3rd Edition, Prentice-Hall Publishers, 2007.
2. Mark Burrell, "Fundamentals of Computer Architecture", Mcmillan Higher Education, 2003.
3. John D. Carpinelli, "Computer Systems Organization and Architecture", Pearson Education, 2001.
4. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", 5th Edition, McGraw-Hill, 2002.
5. William Stallings, "Computer Organization and Architecture - Designing for Performance", 9th Edition, Prentice Hall, 2012.
6. John P Hayes, Computer Architecture Organization, McGraw Hill Edition 4, 2003.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

PART A : 10 Questions of 2 marks each-No choice

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks

Exam Duration : 3 Hrs.

20 Marks

80 Marks

- Employability

SCSA1403	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To analyze the performance of algorithms under various scenarios.
- To learn mathematical background for algorithm analysis & solving the recurrence equations.
- To learn various algorithm design techniques.
- To understand and apply the algorithms.

UNIT 1 INTRODUCTION

9 Hrs.

Fundamentals of Algorithmic Problem Solving - Time Complexity - Space complexity with examples - Growth of Functions - Asymptotic Notations: Need, Types - Big Oh, Little Oh, Omega, Theta - Properties - Complexity Analysis Examples - Performance measurement - Instance Size, Test Data, Experimental setup.

UNIT 2 MATHEMATICAL FOUNDATIONS

9 Hrs.

Solving Recurrence Equations - Substitution Method - Recursion Tree Method - Master Method - Best Case - Worst Case - Average Case Analysis - **Sorting in Linear Time - Lower bounds for Sorting: - Counting Sort - Radix Sort - Bucket Sort.**

UNIT 3 BRUTE FORCE AND DIVIDE-AND-CONQUER

9 Hrs.

Brute Force:- Travelling Salesman Problem - Knapsack Problem - Assignment Problem - Closest Pair and Convex Hull Problems - Divide and Conquer Approach:- Binary Search - Quick Sort - Merge Sort - Strassen's Matrix Multiplication.

UNIT 4 GREEDY APPROACH AND DYNAMIC PROGRAMMING

9 Hrs.

Greedy Approach:- Optimal Merge Patterns- Huffman Code - Job Sequencing problem- -- Tree Vertex Splitting Dynamic Programming:- Dice Throw-- Optimal Binary Search Algorithms.

UNIT 5 BACKTRACKING AND BRANCH AND BOUND

9 Hrs.

Backtracking:- 8 Queens - Hamiltonian Circuit Problem - Branch and Bound - Assignment Problem Travelling Salesman Problem - NP Complete Problems - Clique Problem - Vertex Cover Problem .

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Determine the suitable algorithmic design technique for a given problem.
- CO2 - Identify the limitations of algorithms in problem solving.
- CO3 - Analyze the efficiency of the algorithm based on time and space complexity.
- CO4 - Implement asymptotic notations to analyze worst-case and average case running times of algorithms.
- CO5 - Interpret the fundamental needs of algorithms in problem solving.
- CO6 - Describe the various algorithmic techniques and its real time applications.

TEXT/REFERENCE BOOKS

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition, PHI Learning Private Limited, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms David E. Goldberg, "Genetic Algorithm In Search Optimization And Machine Learning" Pearson Education India, 2013.
3. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson Education, 2012.
4. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, 2nd Edition, Universities Press, 2007.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

PART A : 10 Questions of 2 marks each-No choice

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks

Exam Duration : 3 Hrs.

20 Marks

80 Marks

Employability

SAIC4003	UNIVERSAL HUMAN VALUES	L	T	P	Credits	Total Marks
		2	1	0	3	100

COURSE OBJECTIVES

- To develop a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence
- To understand (or developing clarity) the harmony in the human being, family, society and nature/existence
- To strengthen self-reflection
- To develop commitment and courage to act

MODULE 1 COURSE INTRODUCTION - NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
 2. Self-Exploration-what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
 3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
 4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every humanbeing with their correct priority
 5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
 6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.
- Practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

MODULE 2 UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
 8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
 9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
 10. Understanding the characteristics and activities of 'I' and harmony in 'I'
 11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
 12. Programs to ensure Sanyam and Health.
- Practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

MODULE 3 UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY- HARMONY IN HUMAN-HUMAN RELATIONSHIP

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
 14. Understanding the meaning of Trust; Difference between intention and competence
 15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
 16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
 17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
- Practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

MODULE 4 UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS COEXISTENCE

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

21. Holistic perception of harmony at all levels of existence.

Practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

MODULE 5 IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS

22. Natural acceptance of human values

23. **Definitiveness of Ethical Human Conduct**

24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

25. **Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order
Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and
b.
develop appropriate technologies and management patterns for above production systems.**

26. Case studies of typical holistic technologies, management models and production systems

27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

28. Sum up.

Practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Total: 28 Lectures And 14 Practice Sessions

COURSE OUTCOMES

On completion of the course, the student are expected

CO1: To become more aware of themselves, and their surroundings (family, society, nature)

CO2: They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind

CO3: To have better critical ability

CO4: To become sensitive to their commitment towards what they have understood (human values, human relationship and human society)

CO5: To apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction

TEXT /REFERENCE BOOKS

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4. The Story of Stuff (Book).
5. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
6. Small is Beautiful - E. F Schumacher.
7. Slow is Beautiful - Cecile Andrews
8. Economy of Permanence - J C Kumarappa
9. Bharat Mein Angreji Raj – Pandit Sunderlal
10. Rediscovering India - by Dharampal
11. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
12. India Wins Freedom - Maulana Abdul Kalam Azad
13. Vivekananda - Romain Rolland (English)
14. Gandhi - Romain Rolland (English)

- Entrepreneurship

SCSA3016	DATA SCIENCE	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the mathematical foundations required for data science.
- To describe a flow process for data science problems.
- To introduce basic data science algorithms and data visualization.
- To learn machine tools and techniques.
- To learn the ideas and tools for data visualization.

UNIT 1 LINEARALGEBRA

9 Hrs.

Algebraic view – vectors 2D, 3D and nD, matrices, product of matrix & vector, rank, null space, solution of over determined set of equations and pseudo-inverse. Geometric view - vectors, distance, projections, eigenvalue decomposition, Equations of line, plane, hyperplane, circle, sphere, Hypersphere.

UNIT 2 PROBABILITY AND STATISTICS

9 Hrs.

Introduction to probability and statistics, Population and sample, Normal and Gaussian distributions, Probability Density Function, Descriptive statistics, notion of probability, distributions, mean, variance, covariance, covariance matrix, understanding univariate and multivariate normal distributions, introduction to hypothesis testing, confidence interval for estimates.

UNIT 3 EXPLORATORY DATA ANALYSIS AND THE DATA SCIENCE PROCESS

9 Hrs.

Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Data Visualization - Basic principles, ideas and tools for data visualization - Examples of exciting projects- [Data Visualization using Tableau](#).

UNIT 4 MACHINE LEARNING TOOLS, TECHNIQUES AND APPLICATIONS

9 Hrs.

Supervised Learning, Unsupervised Learning, Reinforcement Learning, Dimensionality Reduction, Principal Component Analysis, Classification and Regression models, Tree and Bayesian network models, Neural Networks, Testing, [Evaluation and Validation of Models](#).

UNIT 5 INTRODUCTION TO PYTHON

9 Hrs.

[Data structures-Functions-Numpy-Matplotlib-Pandas- problems based on computational complexity-Simple case studies based on python \(Binary search, common elements in list\), Hash tables, Dictionary.](#)

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Explain the basic terms of Linear Algebra and Statistical Inference.
- CO2 - Describe the Data Science process and how its components interact.
- CO3 - Apply EDA and the Data Science process in a case study.
- CO4 - Classify Data Science problems.
- CO5 - Analyse and correlate the results to the solutions.
- CO6 - Simulate Data Visualization in exciting projects.

TEXT / REFERENCE BOOKS

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014.
2. Introduction to Linear Algebra - By Gilbert Strang, Wellesley-Cambridge Press, 5th Edition.2016.
3. Applied Statistics and Probability For Engineers – By Douglas Montgomery.2016.
4. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
5. Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science.
6. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd Edition. ISBN 0123814790. 2011.
7. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, 2nd Edition. ISBN 0387952845. 2009. (free online)

- Employability

SCSA3015	DEEP LEARNING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To present the mathematical, statistical and computational basis of neural networks.
- To study the concepts of deep learning.
- To introduce dimensionality reduction techniques.
- To enable the students to know deep learning techniques to support real-time applications.
- To examine the case studies of deep learning techniques.

UNIT 1 INTRODUCTION

9 Hrs.

Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates.

UNIT 2 DEEP NETWORK

9 Hrs.

History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks- Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning.

UNIT 3 DIMENTIONALITY REDUCTION

9 Hrs.

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyper parameter optimization.

UNIT 4 OPTIMIZATION AND GENERALIZATION

9 Hrs.

Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization- Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience

UNIT 5 CASE STUDY AND APPLICATIONS

9 Hrs.

Imagenet- Detection-Audio WaveNet-Natural Language Processing Word2Vec - Joint Detection- Bioinformatics- Face Recognition- Scene Understanding- Gathering Image Captions.

Max.45 Hrs.

COURSES OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand basics of deep learning.
- CO2 - Implement various deep learning models.
- CO3 - Realign high dimensional data using reduction techniques.
- CO4 - Analyze optimization and generalization in deep learning.
- CO5 - Explore the deep learning applications.
- CO6 - Design and creation of data models.

TEXT / REFERENCE BOOKS

1. Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
2. Deng and Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
3. Ian Good fellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
4. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

PART A : 10 Questions of 2 marks each-No choice

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks

Exam Duration : 3 Hrs.

20 Marks

80 Marks

- Employability

SCSA1501	OPERATING SYSTEMS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To have an overview of different types of operating systems.
- To learn and implement the concept of process management.
- To observe the concept of storage management.
- To understand the concept of I/O and file systems.
- To learn the basics of Linux Programming.

UNIT 1 INTRODUCTION

9 Hrs.

Introduction - Operating system structures - System components - OS services - System calls - System structure - Resources Processes - Threads - Objects - Device management - Different approaches - Buffering device drivers.

UNIT 2 PROCESS MANAGEMENT

9 Hrs.

Processes - Process concepts - Process scheduling - Operations on processes - Cooperating processes - CPU scheduling -

UNIT 3 SYNCHRONIZATION AND DEADLOCKS

9 Hrs.

The critical section problem - Semaphores - Classic problems of synchronization - Critical regions - Monitors-Dead locks - Deadlock characterization - Prevention - Avoidance - Detection - Recovery.

UNIT 4 MEMORY MANAGEMENT

9 Hrs.

Storage Management Strategies - Contiguous Vs. Non-Contiguous Storage Allocation - Fixed and Variable Partition Multiprogramming
Anticipatory Paging - File Concepts - Access Methods - Directory Structure - File Sharing - Protection - File - System Structure - Implementation.

UNIT 5 I/O SYSTEM, LINUX & SHELL PROGRAMMING

9 Hrs.

Mass Storage Structure - Disk Structure- Disk Scheduling - Disk Management - Swap Space Management -
- Shell Operation Commands - File Management Operation - Internet Service - Telnet - FTP - Filters and Regular Expressions- Case Study (Linux) - Shell Programming - Variable, Arithmetic Operations, Control Structures, Handling Date, Time and System Information.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand the fundamental components of a computer operating system and how computing resources are managed by the operating system.
- CO2 - Apply the concepts of CPU scheduling, synchronization and deadlocks in real computing problems.
- CO3 - Demonstrate the different memory and I/O management techniques used in Operating Systems.
- CO4 - Have practical exposure to the concepts of semaphores and monitors for process synchronization.
- CO5 - Create design and construct the following OS components: Schedulers, Memory management systems in the modern operating system.
- CO6 - Understand file system structure and implement a file system such as FAT.

TEXT/ REFERENCE BOOKS

1. Abraham Silberschatz, Peter Galvin and Gagne, "Operating System Concepts", 10th Edition, Addison Wesley, 2018.
2. Harvey M.Deitel, "Operating System", 3rd Edition, Addison Wesley, 2004.
3. Gary Nutt, "Operating System, A modern perspective", 3rd Edition, Addison Wesley, 2004.
4. Richard Peterson, "Linux : The Complete Reference", 6th Edition, Tata McGraw Hills, 2008.
5. Andrew S. Tanenbaum, "Modern Operating Systems".4th edition 2015.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 Questions of 2 marks each-No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks

80 Marks

 - Employability

SCSA1502	COMPUTER NETWORKS AND DESIGN	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To recognize the principles of the big picture of computer networks.
- To understand the networking environment.
- To know the importance of VPNs.
- To convey the availability of tools and techniques for networking.
- To discuss about evolving technologies in networks.

Design Principles - Determining Requirements - Analyzing the Existing Network - Preparing the Preliminary Design - Completing the Final Design Development - Deploying the Network - Monitoring and Redesigning – Maintaining - Design Documentation - Modular Network Design - Hierarchical Network Design.

UNIT 2 UNDERLYING LAN CONCEPTS

9 Hrs.

LAN connectivity for small businesses – Integration – Token-Ring – Ethernet – ATM LAN emulation – InterLAN Switching – LAN to Mainframe – Building networks.

Virtual Network management and planning – VPNs for small businesses – Secure remote access in VPNs – IPSec VPNs – Integrating data centers with Intranets – Implementing and supporting Extranets.

UNIT 4 NETWORKING TOOLS AND TECHNIQUES

9 Hrs.

Simulation method for designing multimedia networks – Determining remote bridge and router delays – Network baselining as a planning tool.

UNIT 5 EVOLVING TECHNOLOGIES

9 Hrs.

Trends in data communications – Merits of xDSL technology – Preparing for cable modems - Voice and video on the LAN – Internet voice applications – Building IP PBX telephony network – Fax over IP – Videoconferencing over IP networks.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand the principles of networks.
- CO2 - Interpret LAN concepts and design.
- CO3 - Gain knowledge in evolving technologies.
- CO4 - Clearly outline the logic behind VPNs.
- CO5 - Know the importance of tools and techniques in building a network.
- CO6 - Understand the underlying working concepts of a real-time network.

TEXT/ REFERENCE BOOKS

1. Gil Held, "Network Design: Principles and Applications (Best Practices)", Auerbach Publications, 1st edition, 2000.
2. Diane Tiare and Catherine Paquet, "Campus Network Design Fundamentals", Pearson Education, 1st edition, 2006.
3. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann Publishers Inc., 5th edition, 2012.
4. William Stallings, "Data and Computer Communications", Pearson Education, 8th edition, 2016.
5. James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", Pearson Education, 6th edition, 2012.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

PART A : 10 Questions of 2 marks each-No choice

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks

Exam Duration : 3 Hrs.

20 Marks

80 Marks

 - Employability

SITA1502	CUSTOMER INTERFACE DESIGN AND DEVELOPMENT	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To develop static websites and dynamic web applications.
- To learn new emerging web technologies.
- To gain knowledge and skills required for web development careers.
- To develop skills in the use and application of specific methods in user experience design.

UNIT 1 HTML, XML, CSS AND RWD

9 Hrs.

Introduction To HTML- DHTML , XML – Structuring XML document using DTD – Schemas – XML parsers – DOM – SAX presentation technologies – XSL – XFORMS – XHTML – Transformations – XSLT – XLINK – XPATH – XQuery. Responsive Web Design-Intro-Fluid Grid-Viewport-Media Queries-Images. Introduction To CSS-Syntax, Selectors-Types of style sheets.

UNIT 2 CLIENT SIDE SCRIPTING

9 Hrs.

Java Script – Advantages – Data types – Variables – Operators – Control statements – Functions – Objects and arrays – Windows and frames – Forms. AJAX – XMLHttpRequest (XHR) – Create Object – Request – Response – Ready state.

UNIT 3 SERVER SIDE SCRIPTING

9 Hrs.

Introduction To PHP – Data Types – Control Structures – Arrays - Function – Html Form with PHP –Form Handling and Validation - File Handling – Cookies – Sessions – Filters – Exception Handling - Database Connectivity With MySQL.

UNIT 4 ANGULAR JS AND JQUERY

9 Hrs.

Angular JS Expression – Modules – Directives – Data Binding – Controllers – Scopes – Filters – Services – Tables – Events – Form – Validation. jQuery Syntax – Selects – Events – jQuery Effects – jQuery – jQuery HTML – jQuery Traversing.

UNIT 5 UX AND UI

9 Hrs.

UX Introduction -Elements of UX Design- UX Design Process- Research Methods and Tools-Understanding User

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Able to work with XML technologies.
- CO2 - Design web page to perform form validation using client-side scripting language.
- CO3 - Implement new technologies such as Angular JS & jQuery.
- CO4 - Develop web applications using server-side scripting language.
- CO5 - Understand the differences between usability and user experience.
- CO6 - Effectively select and utilize design thinking processes and UX/UI tools.

TEXT/ REFERENCE BOOKS

1. Jeffrey C. Jackson, Web Technologies: A Computer Science Perspective, Pearson Education, 2009
2. Kogent Learning Solutions Inc., Web Technologies Black Book, Dreamtech Press, 2009.
3. Ken Williamson, Learning AngularJS: A Guide to Angular JS Development, O'Reilly, 2015
4. Jon Duckett, JavaScript and JQuery: Interactive Front-End Web Development, John Wiley and Sons Inc., 2014.
5. Callum Macrae, Learning from JQuery, O'Reilly, 2013.
6. Steve Krug, Dont Make Me Think, 2nd Edition, New Riders Publishing, USA, 2006.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 Questions of 2 marks each-No choice

20

MarksPART B : 2 Questions from each unit with internal choice, each carrying 16 marks

80

Marks

- Employability

SCS A1503	FOG AND CLOUD COMPUTING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the basic concepts of cloud computing and cloud enables.
- To understand cloud services and Multi-tenancy computing.
- To study about various models of cloud environments and virtualization.
- To manage the cloud computing infrastructure with security.
- To gain knowledge of cloud and to understand about Fog, edge computing.

UNIT 1 UNDERSTANDING CLOUD COMPUTING

9 Hrs.

Basic Concepts and Terminology - Cloud Computing Architectural Framework - Types of Clouds - pros and cons of cloud computing – Cloud Characteristics - difference between web 2.0 and cloud - key challenges in cloud computing - Major Cloud players - Virtualization in Cloud Computing - Parallelization in Cloud Computing - cloud resource management – Cloud Enabling Technology.

UNIT 2 CLOUD SERVICE MODELS

9 Hrs.

Software as a Service (SaaS) - Infrastructure as a Service (IaaS)- Platform as a Service (PaaS)- Web services - Service Oriented Architecture (SoA) - Elastic Computing - On Demand Computing- Service Management in Cloud Multi-tenancy computing , architecture.

UNIT 3 CLOUD DEPLOYMENT MODELS AND VIRTUALIZATION

9 Hrs.

Deployment models: Public cloud – Private Cloud –Hybrid cloud – Community cloud - Need for virtualization – Types of Virtualization – Virtualization OS – VMware, KVM – System VM – Process VM – Virtual Machine Monitor – Properties - Xen, Hyper V, Virtual Box, Eucalyptus .

UNIT 4 MANAGEMENT IN CLOUD COMPUTING AND SECURITY

9 Hrs.

Cloud data centres - Energy efficiency in data centre - Data Management in Cloud Computing - Mobile cloud computing service models – Open Source and Commercial Clouds, Cloud Simulator – sensor cloud- Fundamental Cloud security – Cloud security Threads – Additional considerations – Security solutions a case study.

UNIT 5 FOG COMPUTING

9 Hrs.

From Cloud to Fog - Fog Computing architecture - fog networks - Principles of Edge/P2P networking - Security and privacy in Fog.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Analyze the Cloud computing setup with its vulnerabilities and applications using different architectures.
- CO2 - Implement and install the cloud tools to make enable the cloud computing infrastructures.
- CO3 - Apply and design suitable Virtualization concept, Cloud Resource Management and collaboration services.
- CO4 - Create combinatorial auctions for cloud resources and services for computing clouds Develop and make cloud services as commercial.
- CO5 - Assess cloud and cloud to Fog with IoT.
- CO6 - Ability to, understand fog computing architecture.

TEXT / REFERENCE BOOKS

1. Cloud computing concepts, technology and Architecture-Thomas Erl, Zaigham Mahmood, Ricardo Puttini, Pearson, 2017.
2. Instant Guide to Cloud Computing, Anand Nayar (Ed), Ashokkumar, Sudeep Tanwar, BPB, 2019.
3. Cloud Computing a practical approach - Anthony T.Velte, Toby J. Velte Robert Elsenpeter Tata McGraw Hill, New Delhi – 2010.
4. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008.
5. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010.
6. Fog Computing Concepts, Frameworks and Technologies, Mahmood, Zaigham (Ed.), Springer, 2018.

- Employability

SCSA3091	SOCIETY 5.0	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

- To understand the society 5.0, Cyberspace And Physical Space to solve
- To Provide knowledge and overview about Big data, IoT and Artificial Intelligence for Society 5.0.
- Discuss To understand Augmented Reality and Virtual Reality, Next Generation Sensors
- To discuss about Challenges and Technologies towards Society 5.0, Security of Cyber Physical Systems
- Discuss to apply society 5.0 Innovation with Future Trends with Applications

UNIT I

(9 hrs)

INTRODUCTION TO SOCIETY 5.0

Introduction –Schema of society 5.0-Characteristics of Society 5.0. Introduction to communication technologies: Artificial Intelligence – robotics - 3D Printing. People: Centric Society -Knowledge Sharing- Physical space-Cyberspace – Humanity VS Society 5.0 –Elements of Society 5.0-Data Driven to Society- Modeling real world Issues.

UNIT II

(9 hrs)

EMERGING TECHNOLOGIES WITH SOCIETY 5.0

Introduction to Big Data – Issues and Challenges in the traditional systems –Intelligent Data Analysis –Big Data Storage Statistical Concepts: Sampling Distributions - Re-Sampling - Prediction Error – Random Sampling– Artificial Intelligence – Foundations of AI - Intelligent agent - Types of agents - Structure - Problem solving agents -Internet of Things- Introduction to IoT- Basic Architecture of an IoT, From M2M to IoT, M2M towards IoT-Robotics- Robotics system components - Robot classification Coordinate frames - degree of freedom - dynamic stabilization of robots.

UNIT III

(9 hrs)

INTRODUCTION TO INDUSTRY 4.0

Introduction-Globalization and Emerging Issues, LEAN Production Systems, Smart and Connected Business Perspective, Cyber Physical Systems and Next Generation Sensors, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis- An emerging industrial structure for IoT -Cyber security in Industry 4.0-Basics of Industrial IoT, Common Issues in Industry 4.0 and Society 5.0.

UNIT IV

(9 hrs)

CHALLENGES AND TECHNOLOGIES TOWARDS SOCIETY 5.0

Overcome with Economic Development and Solution to Social Problems in Society 5.0- Security of Cyber Physical Systems -Embedded and CPS security - attacks and countermeasures, authentication, identification, confidentiality, data integrity, authorization, access control, malware attacks and counter-measures, security protocols- Social Issues in Society 5.0 - human-centered society (Society 5.0)- Sustainable Development Goals-Economic Advancement- Resolution to Social Problems..

UNIT V

(9 hrs)

INNOVATION WITH FUTURE TRENDS WITH APPLICATIONS

Mobility-Health Care- Architecture-food Products –Disaster Prevention

Max 45hrs

COURSE OUTCOMES

- CO1 - Able to understand the Social Problems By A System That Highly Integrates Cyberspace and Physical Space to solve
- CO2 - Ability to get skills For Economic Development And A Human-Centered Society That Balances Economic Advancement
- CO3 - Achieve A High Degree Of Convergence Between Cyberspace (Virtual Space) And Physical Space (Real Space)
- CO4 - Able to Use Of Emerging Technologies With Society 5.0 To Achieve The More Production / Avoid Loss Of Productions
- CO5 - Able Internet and IoT , Big data for production lines to be adaptive, intelligent, and flexible enough to meet the updated requests.
- CO6 - Design and apply in Health Care , Agriculture, Food Products, Disaster Prevention

TEXT/ REFERENCE BOOKS:

1. Society 5.0 A People –Centric Super –Smart Society, Hitachi –Utokyo Laboratory, Springer,2020.
2. Society 5.0 Industry of the Future Technologies Methods and Tools By Bruno Salgues,Wiley, 2018
3. Stuart J.Russel, Peter Norvig, "Artificial Intelligence A Modern Approach ", 3rd Edition, Pearson Education, 2009.

 - Entrepreneurship

SCSA1503	COMPUTER GRAPHICS AND MULTIMEDIA APPLICATIONS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To introduce two and three dimensional graphical structure.
- To design 2D and 3D methods and Models.
- To explore the visible surface detection with illumination and color models.
- To understand the concepts involved in multimedia and basis tools.
- To gain knowledge on Multimedia compression and animations.

UNIT 1 BASICS OF COMPUTER GRAPHICS

9 Hrs.

Output primitives- Survey of Computer Graphics-Overview of Graphics System- Line drawing Algorithm (DDA Line Drawing Algorithm, Bresenham's Line Drawing Algorithm)-Circle drawing Algorithm- Curve Drawing Algorithm- Attributes of output Primitives- Antialiasing.

UNIT 2 2D TRANSFORMATION AND VIEWING

9 Hrs.

2D Transformation and other transformation – 2D and 3D Viewing- Line Clipping(Cohen Sutherland)– Polygon Clipping (Sutherland Hodgeman) – Logical Classification Input Function.

UNIT 3 3D CONCEPTS AND CURVES

9 Hrs.

3D Object: Representation Method- B-Rep- Sweep Representation- 3D Transformation – curve generation – Splines – Bezier's – Blending of curves other interpolation techniques- Display Curves and Surface – Shape Description Requirements – Parametric function – 3D Concept Introduction – Fractals and Self Similarity – Successive refinement of Curves – Koch Curves and Peano Curves.

UNIT 4 METHODS AND MODELS

9 Hrs.

Visual Surface detection methods – Illumination models – Halftone Patterns – Dithering Techniques – Polygon Rendering Methods – Ray Tracing Methods – Color methods – Color Applications.

UNIT 5 MULTIMEDIA BASIS AND TOOLS

9 Hrs.

Multimedia Basics and Tools – Introduction to Multimedia – Compression and Decompression – Data and File Format Standards – Digital voice and audio video image animation- Introduction to photoshop- workshop tools- Navigating window – Importing and Exporting Images – Operations on Images – resize, Crop, rotate.Introduction to Flash – Elements of Flash Documents – Flash Environment- Drawing Tools – Flash Animation Importing and Exporting – Adding Sounds – Publishing Flash Movies.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Identify the various line and circle drawing algorithm.
- CO2 - Study the various transformations in 2D and 3D objects.
- CO3 - Understand the concepts of curves and surface.
- CO4 - Apply transformation and clipping algorithm in 2D and 3D objects.
- CO5 - Design Illumination and color models.
- CO6 - Implement 2D and 3D Transformation concepts in Real world Applications.

TEXT / REFERENCE BOOKS

1. Donald Hearn and M. Pauline Baker, Computer Graphics C Version, 2nd Edition, Prentice Hall, 2006.
2. Fabio Ganovelli, Massimiliano Corsini, Sumanta Pattanaik, Marco Di Benedetto "Introduction to Computer Graphics: A Practical Learning Approach" Taylor and Francis Group. 2015.
3. Tay Vaughan, "Multimedia", 5th Edition, Tata McGraw Hill, 2001.
4. Ze-Nian Li, Mark S. Drew, "Fundamentals of Multimedia", Prentice Hall of India, 2004.
5. D.P. Mukherjee, "Fundamentals Of Computer Graphics And Multimedia " Prentice Hall of India Private Limited, 2006.
6. D. McClelland, L.U.Fuller, "Photoshop CS2 Bible", Wiley Publishing, 2005.

 - Employability

SCSA2501	COMPUTER NETWORKS LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To understand how to implement socket programming.
- To be familiar with simulation tools.
- To understand how to create applications using TCP and UDP.
- To gain Knowledge on various networking protocols.

SUGGESTED LIST OF EXPERIMENTS

1. To find IP address of a machine.
2. Time and Date server.
3. Echo UDP server.
4. TCP sockets.
 - a. Echo client & server
 - b. Chat
 - c. File transfer
5. Daemon program.
6. Implementing stop and wait protocol & sliding window protocol.
7. Code simulating ARP/RARP protocols.
8. Code simulating PING and TRACEROUTE commands.
9. RPC (Remote Procedure Call).
10. Study of Network Simulator (NS) and simulation of Congestion Control algorithms using NS.
11. Case study
 - a. Flooding
 - b. Link state routing
 - c. Distance vector routing

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Analyze the performance of the protocols in different layers.
- CO2 - Implement various protocols.
- CO3 - Design with simulation tools.
- CO4 - Analyze various routing algorithms.
- CO5 - Construct Wi-Fi model.
- CO6 - Understand socket programming.

 - Skill Development

SCSA2502	OPERATING SYSTEMS LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To write programs in Linux environment using system calls.
- To implement the scheduling algorithms.
- To implement page replacement algorithms.
- To implement file allocation methods.
- To develop solutions for synchronization problems using semaphores.

SUGGESTED LIST OF EXPERIMENTS

1. Study of basic LINUX and vi Editor command.
2. String and Numerical Handling Functions.
3. Loop and Selection Constructs.
4. File Handling Functions.
5. Manipulate Date/Time/Calendar.
6. Retrieve System information.
7. Implementation of process scheduling mechanism – FCFS, SJF, Priority Queue.
8. Producer Consumer Problem using Semaphores.
9. Reader – Writer Problem.
10. Diner's Philosopher Problem.
11. First Fit, Worst Fit, Best Fit allocation strategy.
12. Bankers Algorithm.
13. Simulate Paging Technique of Memory Management.
14. Simulate Page Replacement Algorithms.
15. Implement memory management Scheme.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Learn the basic services and functionalities of the operating system using System Calls in Linux.
- CO2 - Model CPU Scheduling such as FCFS, SJF, Priority and Round Robin.
- CO3 - Describe and solve Synchronization Problem.
- CO4 - Simulate Memory Management Technique.
- CO5 - Explain how to perform Paging Techniques.
- CO6 - Demonstrate Page Replacement Algorithms.

 - Skill Development

SCSA1601	MACHINE LEARNING	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To focus on the construction and study of algorithms that can learn from data.
- To emphasize on the logical, knowledge-based approach.
- To introduce students to the basic concepts and techniques of Machine Learning.
- To develop skills of using recent machine learning software for solving practical problems.
- To gain experience of doing independent study and research.

UNIT 1 INTRODUCTION TO MACHINE LEARNING

9 Hrs.

Machine learning - examples of machine learning applications - Learning associations - Classification -Regression - Unsupervised learning - Supervised Learning - Learning class from examples - PAC learning -Noise, model selection and generalization - Dimension of supervised machine learning algorithm.

UNIT 2 DECISION THEORY

9 Hrs.

Bayesian Decision Theory- Introduction- Classification - Discriminant function-Bayesian networks-Association rule - Parametric Methods - Introduction - Estimation –Multivariate methods-Data Parameter estimation–Dimensionality Reduction- PCA-Linear discriminant analysis.

UNIT 3 CLUSTERING AND REGRESSION

9 Hrs.

Clustering - Mixture densities - k-means clustering - Supervised Learning after clustering - Hierarchical clustering - Nonparametric Methods - Density estimation - Generalization of multivariate data - Smoothing models -Decision Trees - Univariate trees - Multivariate trees - Learning rules from data - Linear Discrimination-Gradient Descent.

UNIT 4 MULTILAYER PERCEPTRONS

9 Hrs.

Structure of brain - Neural networks as a parallel processing - Perceptron - Multilayer perceptron - Back propagation - Training procedures - Tuning the network size - Learning time.

UNIT 5 LOCAL MODELS

9 Hrs.

Competitive learning - Adaptive resonance theory - Self organizing map -Radial Basis functions - Bagging- Boosting- Reinforcement Learning.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand complexity of Machine Learning algorithms and their limitations.
- CO2 - Understand modern notions in data analysis oriented computing.
- CO3 - Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own.
- CO4 - Be capable of performing distributed computations.
- CO5 - Can demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.
- CO6 - Gain ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems.

TEXT / REFERENCE BOOKS

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 2004.
2. Tom Mitchell, "Machine Learning", McGraw Hill, 1997.
3. Shai Shalev-Shwartz and Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2014.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

PART A : 10 Questions of 2 marks each-No choice

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks

Exam Duration : 3 Hrs.

20 Marks

80 Marks

- Employability

SCSA1602	NETWORK SECURITY	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To understand the fundamentals of Cryptography.
- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To explore the various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across data networks.
- To learn various mechanisms for network security to protect against the threats in the networks.

UNIT 1 INTRODUCTION

9 Hrs.

Services, Mechanisms and attacks - The OSI Security Architecture- A Model for Network Security – Classical Encryption Technique – Symmetric Cipher Model – Substitution Technique – Rotor Machines – Steganography.

UNIT 2 BLOCK CIPHERS AND THE DATA ENCRYPTION STANDARD (DES)

9 Hrs.

Simplified DES- Block Cipher principles – The Data Encryption Standard – The strength of DES – Confidentiality using symmetric encryption – Placement of encryption - Traffic confidentiality – Key distribution - Random number generation.

Introduction to number theory – Public key cryptography and RSA – Key Management Diffie-hellman Key exchange.

UNIT 4 AUTHENTICATION AND HASH FUNCTIONS

9 Hrs.

Authentication requirements – Authentication functions – message authentication codes – Hash functions – Security of hash functions and MAC'S – MD 5 (Message Digest Algorithm) – HMAC.

Digital Signatures and authentication protocols:

Digital Signatures – Authentication protocols – Digital Signature Standard – Kerbews – X.509 Authentication Service.

UNIT 5 NETWORK SECURITY AND SYSTEM SECURITY

9 Hrs.

Electronic Mail Security – IP Security – Web Security – Intruders – Malicious S/Ws – Firewalls.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Implement various symmetric encryption techniques for given applications.

CO2 - Illustrate various public key encryption techniques.

CO3 - Understand various key encryption mechanisms and key management strategies that can be applied for real time transactions.

CO4 - Evaluate authentication and hash algorithms.

CO5 - Summarize the basic network security mechanisms.

CO6 - Basic concepts of system level security.

TEXT / REFERENCE BOOKS

1. William Stallings, "Cryptography and Network Security", 6th edition, Pearson Education, 2013.
2. Behrouz A. Forouzan "cryptography and network security", ACM Digital Library, 2007
3. Man Young Rhee,"Internet security: cryptographic principles", "Algorithms and Protocols" Whey publications, 2003
4. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002.
5. Joey Holland, "Cryptography: Principles and Practice" Larsen and Keller, 2017.
6. Sahadeo Padhye, Rajeev A. Sahu, Vishal Saraswat, "Introduction of Cryptography", CRC press, 2018.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 Questions of 2 marks each-No choice

20

MarksPART B : 2 Questions from each unit with internal choice, each carrying 16 marks

80

Marks

- Employability

SCSA1604	COMPILER DESIGN	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To understand, design and implement a lexical analyzer.
- To understand, design and implement a parser.
- To understand, design code generation schemes.
- To understand optimization of codes and runtime environment.
- To design and develop a compiler.

UNIT 1 INTRODUCTION TO COMPILERS

9 Hrs.

Structure of compiler – Functions and Roles of lexical phase – Input buffering – Representation of tokens using regular expression – LEX- Properties of regular expression – Finite Automata – Regular Expression to Finite Automata – NFA to Minimized DFA.

UNIT 2 PARSER

9 Hrs.

Role of Parser-Context-free Grammar – Derivations and Parse Tree - Types of Parser –Bottom Up: Shift Reduce Parsing - Operator Precedence Parsing, SLR parser- Top Down: Recursive Decent Parser - Non-Recursive Decent Parser-Error handling and Recovery in Syntax Analyzer-YACC.

Types of Intermediate Code – Representation of three address code - Syntax Directed Translation scheme- Intermediate code generation for: Assignment statements - Boolean statements - Switch-case statement –Procedure call - Symbol Table Generation.

UNIT 4 CODE OPTIMIZATION

9 Hrs.

Principle sources of Optimization - Basic Blocks and Flow Graphs - Loop Optimization and its types – DAG - Peephole optimization - Dominators - Global Data Flow Analysis.

UNIT 5 CODE GENERATION

9 Hrs.

Issues involved in Code generation – Register allocation – Conversion of three address code to assembly code using code generation algorithm – Examples – Procedure for converting assembly code to machine code – Case study.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Describe the various stages involved in the design of a compiler.
- CO2 - Construct grammars and lexical rules for a programming language.
- CO3 - Explain the syntactic and semantic structure in compiler design.
- CO4 - Evaluate various methods of optimizations on intermediate code.
- CO5 - Generate target code for any source code.
- CO6 - Design, develop, and implement a compiler for any programming language.

TEXT / REFERENCE BOOKS

1. Alfred V Aho, Monica S. Lam, Ravi Sethi and Jeffrey D Ullman, "Compilers – Principles, Techniques and Tools", 2nd Edition, Pearson Education, 2007.
2. Steven S. Muchnick, "Advanced Compiler Design and Implementation,"Morgan Kaufmann Publishers – Elsevier Science, India, Indian Reprint 2003.
3. V. Raghavan, Principles of Compiler Design, Tata McGraw Hill Education Publishers, 2010.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

PART A : 10 Questions of 2 marks each-No choice

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks

Exam Duration : 3 Hrs.

20 Marks

80 Marks

- Employability

SCSA1603	BIG DATA ANALYTICS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To become familiar with the fundamental concepts of Big Data.
- To be competent in identifying the challenges in handling large volumes of data.
- To propose scalable solutions.
- To understand the impact of Big Data in business intelligence, scientific discovery, and in day-to-day life.
- To learn the tools and techniques for handling large datasets.

UNIT 1 INTRODUCTION

9 Hrs.

Introduction to Big Data – Issues and Challenges in the traditional systems - Evolution of Big Data – Four V's of Big Data – Big Data Use Cases and characteristics – Intelligent Data Analysis – Data Analytic Tools – Big Data Storage Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error – Random Sampling.

UNIT 2 BIG DATA TOOLS I

9 Hrs.

Big Data Applications using Pig and Hive – Fundamentals of HBase and ZooKeeper – IBM Infosphere Big Insights – Introduction to FLUME – KAFKA.

UNIT 3 BIG DATA TOOLS II

9 Hrs.

Introduction to NoSQL - MongoDB – Spark – Cassandra - Cassandra Data Model – Data Design – Cassandra Architecture – Read and Write Data – Clients – Integrate with Hadoop. Introduction - Importance of Effective Data Visualization - Introduction to Tableau - Choosing the Right Chart Type - Using the Color Effectively Reducing Clutter - Dashboard Creation and Formatting.

UNIT 4 HADOOP

9 Hrs.

Introduction to Hadoop – Hadoop Distributed File System – Analysing data with Hadoop – Scaling – Streaming – Clustering: Single Node and Multi Node – Working with Hadoop Commands – Working with Apache Oozie.

UNIT 5 MAP REDUCE

9 Hrs.

Algorithms using map reduce - Matrix-Vector – Multiplication – Word Count - Understanding inputs and outputs of MapReduce, Data Serialization – Introduction to YARN – MapReduce Vs YARN – YARN Architecture – Scheduling in YARN – Fair Scheduler – Capacity Scheduler.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Configure the tools required for setting up Big Data Ecosystem.

CO2 - Understand conceptually how Big Data is stored and organized.

CO3 - Use appropriate models of analysis, assess the quality of input, derive insight from results, and investigate potential issues.

CO4 - Interpret data findings effectively in visual formats.

CO5 - Explore the fundamentals of various big data applications.

CO6 - Implement the Algorithms for data analytics.

TEXT / REFERENCE BOOKS

1. Joshua N. Milligan, "Learning Tableau", Packt Publishing, 2015.
2. Chuck Lam, "Hadoop in Action", Manning Publications Co., 2018.
3. Tom White, "Hadoop the Definitive Guide", O'Reilly, 4th Edition, 2015.
4. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilly, 2010.
5. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, Edition I, ISBN-10: 1107015359 | ISBN-13: 978-1107015357, 2011.
6. Jimmy Lin and Chris Dyer, "Data-Intensive Text Processing with MapReduce", Morgan and Claypool Publishers, 2010.
7. Jonathan R. Owens, Brian Femiano, and Jon Lentz, "Hadoop Real World Solutions Cookbook", Packt Publishing, ISBN-10: 1849519129 | ISBN-13: 978-1849519120, 2013

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A: 10 Questions of 2 marks each-No choice

20 Marks

PART B: 2 Questions from each unit with internal choice, each carrying 16 marks

80 Marks

- Employability

SCSA4007	DESIGN AND DEVELOPMENT OF BLOCKCHAIN	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand how blockchain works in terms of Bitcoin and Ethereum.
- To learn about the various decentralized blockchain.
- To know the differences between proof of work and stake.
- To design and build own blockchain.
- To integrate own ideas with blockchain using Ethereum Wallet and Smart Contract.

UNIT1 BLOCKCHAIN BASICS

9Hrs.

Basics of Crypto economics- Blockchain – Cryptocurrencies overloaded –Blockchain in Nutshell: Benefits and Challenges – Blockchain types - Blockchain Peer to Peer Network: Consensus Mechanisms, Proof of Work, Proof of Stake, Mining Layer, Propagation Layer, Semantic Layer, Application Layer

UNIT2 COMPONENTS AND STRUCTURE OF BLOCKCHAIN

9Hrs.

Blocks – Chain between the blocks – Digital signatures and Hashing – Block data examples: Bitcoin block, Ethereum block, Block time and Block size, Global Size – Blockchain miners and validators – Blockchain speed: Blockchain throughput and comparison with traditional network

UNIT3 DECENTRALIZATION USING BLOCKCHAIN

9Hrs.

Methods of decentralization – Routes to decentralization – Blockchain and full ecosystem decentralization: Computation, Storage, Communication and decentralization – Smart Contracts – Organization of decentralization: Decentralized Autonomous: Organizations, Corporations, Societies, DApps and their requirements, Operations of DApps – Example of DApps: KYC-Chains, Open Bazaar, Lazooz

UNIT4 CREATING AN OWN BLOCK CHAIN

9Hrs.

Creating: Basic P2P network, Genesis Blocks and Sharing Blocks – Registering Miners and Creating new blocks – Storing blocks

– Creating: Blockchain wallet, API, Command Line Interface – Blockchain Wallet and Transaction: Wallet, Transaction and Colored Coins

UNIT5 ETHEREUM WALLET & SMART CONTRACT

9Hrs.

Ganache Full node Client – IntelliJ Plugin for Solidity – Truffle Suite: Create your Smart Contract – Connect Truffle to Smart Contract: Hello world, MD5 Smart Contract, Smart Contract with truffle, Deploy the Smart Contract to your deployment

network – Truffle Console – Operation with your Smart Contract via the Truffle CLI – Cryptocurrency Mining: Mining Hardware,

Miner Types, Mining Pools, Mining Software

Max. 45 Hrs.

COURSE OUTCOMES

- CO1: Understanding emerging technology models of blockchain
- CO2: Known to deal with the component and structure of blockchain
- CO3: Deals to work with various decentralized blockchain
- CO4: Familiar with Ethereum wallet and smart contract
- CO5: Applications and implementation strategies
- CO6: Design and develop own blockchain for a real time application

TEXT /REFERENCE BOOKS

1. EladElrom,"The Blockchain Developer A Practical Guide for Designing, Implementing, Publishing, Testing, and Securing Distributed Blockchain-based Projects",Apress (2019)
2. Brenn Hill, Samanyu Chopra, Paul Valencourt, Narayan Prusty, "Blockchain Developer's Guide Develop Smart Applications with Blockchain Technologies - Ethereum, JavaScript, Hyperledger Fabric, and Corda",Packt Publishing (2018)
3. Salman A. Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, "Hands-On Blockchain with Hyperledger Building Decentralized Applications with Hyperledger Fabric and Composer", Packt Publishing (2018)
4. Imran Bashir, Narayan Prusty, "Advanced Blockchain Development Build Highly Secure, Decentralized Applications and Conduct Secure Transactions",Packt Publishing (2019)

SCSA3019	AUGMENTED AND VIRTUAL REALITY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To make students know the basic concept and framework of virtual reality.
- To teach students the principles and multidisciplinary features of virtual reality.
- To teach students the technology for multimodal user interaction and perception in VR, in particular the visual, audial and haptic interface and behavior.
- To teach students the technology for managing large scale VR environment in real time.
- To provide students with an introduction to the VR system framework and development tools.

UNIT 1 INTRODUCTION OF VIRTUAL REALITY

9 Hrs.

Fundamental Concept and Components of Virtual Reality- Primary Features and Present Development on Virtual Reality - VR systems - VR as a discipline-Basic features of VR systems-Architecture of VR systems-VR hardware -VR input hardware: tracking systems, motion capture systems, data gloves-VR output hardware: visual displays

UNIT 2 I/O INTERFACE AND TECHNIQUES IN VR

9 Hrs.

Multiple Modals of Input and Output Interface in Virtual Reality: Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual / Auditory / Haptic Devices. Interactive Techniques in Virtual Reality: Body Track, Hand Gesture, 3D Manus, Object Grasp.

UNIT 3 VISUAL COMPUTATION IN VIRTUAL REALITY

9 Hrs.

Fundamentals of Computer Graphics-Software and Hardware Technology on Stereoscopic Display-Advanced Techniques in CG: Management of Large Scale Environments & Real Time Rendering -Development Tools and Frameworks in Virtual Reality: Frameworks of Software Development Tools in VR. X3D Standard; Vega, MultiGen, Virtoolsetc

UNIT 4 INTRODUCTION OF AUGMENTED REALITY

9 Hrs.

System Structure of Augmented Reality-Key Technology in AR-- AR software development - AR software. Camera parameters and camera calibration. Marker-based augmented reality. Pattern recognition. AR Toolkit

UNIT 5 APPLICATION OF VR IN DIGITAL ENTERTAINMENT

9 Hrs.

VR Technology in Film & TV Production.VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.3D user interfaces - Why 3D user interfaces. Major user tasks in VE. Interaction techniques for selection, manipulation and navigation.3DUI evaluation.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Design and implement the VR system.
- CO2 - Implement the Augmented Reality software.
- CO3 - Analyze and design the framework in VR using various software development tools in VR.
- CO4 - Design the multi modal user interface.
- CO5 - Describe the principles and features of VR and AR.
- CO6 - Recognize the technologies used to manage the large scale VR environment in real time.

TEXT / REFERENCE BOOKS

1. Sherman, William R. and Alan B. Craig. Understanding Virtual Reality – Interface, Application, and Design, Morgan Kaufmann, 2002.
2. Fei GAO. Design and Development of Virtual Reality Application System, Tsinghua Press, March 2012.
3. Guangran LIU. Virtual Reality Technology, Tsinghua Press, Jan. 2011.
4. Burdea, G. C. and P. Coffet. Virtual Reality Technology, 2nd Edition. Wiley-IEEE Press, 2003/2006.

SCSA2302	CODE OPTIMIZATION AND DEBUGGING - I	L	T	P	Credits	Total Marks
		0	0	2	1	50

COURSE OBJECTIVES

- To improve the intermediate code by making it consume fewer resources.
- To get the faster running machine code.
- To improve the consistency of the code.
- To enhance the readability of the code and easier code maintenance.
- To improve the work flow of the code.

SUGGESTED LIST OF EXPERIMENTS

1. Implement Built in Function and Libraries using python.
2. Implement Optimizing loop using python.
3. Profiling CPU usage using python.
4. Profiling memory usage using python.
5. Implement query optimization in DBMS.
6. Implement heuristics in query optimization in DBMS.
7. Implement factorial of given number using memorization in data structure.
8. Implement Divide and conquer method in data structure.
9. Implement hybrid stable sorting algorithm in data structure.
10. Implement linked list with improving the time complexity in data structure.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1: Understand importance of code optimization.
- CO2: Apply time complexity and space complexity of the algorithm for improving optimization.
- CO3: Analyse and appreciate variety of performance measures for various optimization problems.
- CO4: Learn efficient computational procedures to solve optimization problems.
- CO5: Be able to use programming languages to implement optimization algorithms.
- CO6: Be able to reduce the execution time of code by applying proper coding technique.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

CAE: Evaluation of Regular Lab class

Model practical exam

ESE: End Semester Practical Exam

Exam Duration:3 Hrs.

15 Marks

10 Marks

25 Marks

25 Marks

- Skill Development

SCSA2602	COMPILER DESIGN LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To gain in depth knowledge, understanding of compiler design.
- To enrich the knowledge in various phases of compiler and its use.
- To extend the knowledge of parser by parsing LL parser and LR parser.
- To provide practical programming skills necessary for constructing a compiler.
- To implement NFA and DFA from a given regular expression.

SUGGESTED LIST OF EXPERIMENTS

1. Use LEX tool to implement Lexical Analyzer.
2. Use LEX and YACC to implement Parser using Ambiguous Grammar.
3. Use LEX and YACC to implement Parser using Unambiguous Grammar.
4. Use LEX and YACC tool to implement Desktop Calculator.
5. Implement Recursive Descent Parser algorithm.
6. Implement Shift Reduce Parser algorithm.
7. Implement Operator Precedence Parser algorithm.
8. Implement the backend of the compiler to produce three address codes.
9. Implement Symbol Table Management.
10. Construction of NFA and DFA from a regular expression.
11. Implementation of simple code optimization techniques.
12. Construct a Simple compiler.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Apply the LEX tool and YACC tool to develop a scanner and parser.
- CO2 - Demonstrate the process of lexical analysis, parsing and other compiler design aspects.
- CO3 - Achieve practical programming skills necessary for constructing a compiler.
- CO4 - Interpret the symbol table and intermediate code generation.
- CO5 - Construct Automata for any regular language.
- CO6 - Test and simulate the compiler system.

 - Skill Development

SCSA2601	MACHINE LEARNING AND DATA ANALYTICS LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To configure Big Data Ecosystem.
- To work with No SQL Databases.
- To process job scheduling.
- To analyze and Interpret Data.
- To visualize the data insights.

SUGGESTED LIST OF EXPERIMENTS

1. Data Pre-Processing: Building Good Training Sets.
2. Manipulate the Twitter Data Set.
3. Evaluating the results of machine learning algorithms.
4. Implement Regression and Correlation Techniques.
5. Implement Classification Algorithms.
6. No SQL (using Cassandra/MongoDB/Spark).
7. Hadoop – Map Reduce Programs / Commands / Job Scheduling.
8. HDFS.
9. YARN.
10. Working with Pig and Hive.
11. Visualization (using Tableau).

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Able to setup Hadoop in a Cloud / Cluster environment. CO2

- Process and schedule the tasks in the Hadoop platform. CO3 -

Configure nosql databases in the big data ecosystem.

CO4 - Selection of right visualization method based on the intended audience.

CO5 - Creates a dashboard and story based on the data analysis.



- Skill Development

SCSA1701	CYBER PHYSICAL SYSTEMS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To introduce basics of cyber-physical system and Industrial revolution 4.0 concepts.
- To develop an exposition of the challenges in implementing a cyber-physical system.
- To analyze the functional behaviour of CPS based on standard modeling formalisms.
- To design CPS requirements based on operating system and hardware architecture constraints.
- To understand the concepts involved in Cyber Physical Systems Security.

UNIT 1 INTRODUCTION TO INDUSTRY 4.0 AND CYBER PHYSICAL SYSTEM

9 Hrs.

Industry 4.0 - Globalization and Emerging Issues, The Fourth Revolution - Smart and Connected Business Perspective, Basics of Industrial IoT - Industrial Processes - Industrial Sensing and Actuation, Industrial Internet Systems - Basic principles of design and validation of CPS - Cyber-Physical Systems (CPS) in the real world- Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Trends of Industrial Big Data and Predictive Analytics for Smart Business Transformation.

UNIT 2 EMBEDDED SYSTEMS MODELING AND DESIGN AND CPS

9 Hrs.

Platform components - Embedded Systems definition, specification, and languages. Concepts, requirements, examples. Embedded system models at different abstraction levels. Test benches, design under test, Intellectual Property components. Discrete event simulation, semantics, algorithms. Design, analysis techniques for decentralized computer architectures, communication, and hardware-software systems. -Cyber Physical System Hardware Platform - Processors, Sensors, Actuators - Network – Wireless Hart, CAN, Automotive Ethernet – Software stack -Real-Time Operating system (RTOS) - Scheduling Real Time control tasks.

UNIT 3 SENSORS, ACTUATORS AND SENSOR NETWORKS

9 Hrs.

Sensors, Actuators and Sensor Networks and Real-Time and Distributed Systems - Fundamental principles and applications of sensors, actuators. Smart sensors and micro sensor/micro actuator array devices. Introduction to signal processing and sensor/actuator networks, deployment and architecture, wireless communication, multiple access control layer, data gathering, routing and querying, collaborating signal processing - Time dependent systems, clock synchronization, real-time communication protocols, specification of requirements, task scheduling. Validation of timelines, real-time configuration management. Middleware architecture for distributed real-time and secure services.

UNIT 4 SECURITY OF CYBER PHYSICAL SYSTEMS

9 Hrs.

Security of Cyber Physical Systems -Embedded and CPS security - attacks and countermeasures, authentication, identification, confidentiality, data integrity, authorization, access control, malware attacks and counter-measures, security protocols. Privacy issues - vehicular devices and smart metering. Applications of public key and symmetric cryptography, - digital certificates, credentials. Security and vulnerability of cyber-physical infrastructure networks - Mobile and wireless network security, Robust wireless infrastructure - Cloud computing and data security, Event Awareness and System Monitoring for Cyber Physical Infrastructure.

UNIT 5 CYBER-PHYSICAL SYSTEMS CASE STUDIES AND PROJECTS

9 Hrs.

Cyber-Physical Systems Case Studies and Projects - Automotive: SW controllers for Antilock braking system, Adaptive Cruise Control, Lane Departure Warning, Suspension Control - Healthcare: Artificial Pancreas/Infusion Pump/Pacemaker - Green Buildings: automated lighting, AC control - power distribution grid - robotics - civil infrastructure – avionics – Transportation.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - An ability to expose the student to real world problems in CPS and Industrial revolution 4.0 best practices.
- CO2 - Identify the limitations of some computational models.
- CO3 - Apply the theoretical knowledge the design of compilers.
- CO4 - Student can Analyze and verify the correctness of CPS implementations against system requirements and timing constraints.
- CO5 - Categorize the essential modelling formalisms of Cyber-Physical Systems (CPS).
- CO6 - Ability to understand cyber modelling system.

- Entrepreneurship

EXT / REFERENCE BOOKS

1. "Industry 4.0: The Industrial Internet of Things", Alasdair Gilchrist (Apress)
2. "Industrial Internet of Things: Cyber manufacturing Systems" Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer)
3. Edward A. Lee and Sanjit A. Seshia, Introduction to Embedded Systems, A Cyber-Physical Systems Approach, Second Edition, <http://LeeSeshia.org>, ISBN 978-1-312-42740-2, 2015.
4. Rajeev Alur. Principles of Cyber-Physical Systems. MIT Press. 2015.
5. K. J. Astrom and R. M. Murray. Feedback Systems: An Introduction for Scientists and Engineers. Princeton University Press, 2009. http://www.cds.caltech.edu/~murray/amwiki/index.php/Main_Page.
6. Sajal Das, Krishna Kant, and Nan Zhang, Securing Cyber-Physical Critical Infrastructure – Foundations and Challenges, Morgan Kaufmann, 2012.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

PART A: 10 Questions of 2 marks each-No choice

PART B: 2 Questions from each unit with internal choice, each carrying 16 marks

Exam Duration: 3 Hrs.

20 Marks

80 Marks

SCSA1702	ARTIFICIAL INTELLIGENCE	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To understand the various characteristics of intelligent agents.
- To learn the different search strategies in AI.
- To understand the knowledge in solving AI problems.
- To learn the concepts of learning and communication in AI.
- To know about the various applications of AI.

UNIT 1 INTRODUCTION AND PROBLEM SOLVING

9 Hrs.

Introduction – Foundations of AI – History of AI – Intelligent agent – Types of agents - Structure – Problem solving agents – Uninformed search strategies – Breadth first search – Uniform cost search – Depth first search – Depth limited search – Bidirectional search – Searching with partial Information.

UNIT 2 INFORMED SEARCH AND GAME PLAYING

9 Hrs.

Informed search – Strategies – A* Heuristic function – Hill Climbing – Simulated Annealing – Constraint Specification problem – Local Search in continuous space – Genetic algorithm – Optimal decisions in games - Pruning - Imperfect decisions – Alpha-Beta pruning – Games that include an element of chance.

UNIT 3 KNOWLEDGE AND REASONING

9 Hrs.

Knowledge based agent – The Wumpus world environment – Propositional logic – Inference rules – First-order logic – Syntax and semantics – Situation calculus – Building a knowledge base – Electronic circuit domain – Ontological Engineering – Forward and backward chaining – Resolution – Truth maintenance system-Mental Events and Mental Objects.

UNIT 4 ACTING LOGICALLY

9 Hrs.

Planning – Representation of planning – Partial order planning – Planning and acting in real world – Acting under uncertainty – Bayes's rules – Semantics of Belief networks – Inference in Belief networks – Making simple decisions – Making complex decisions.

UNIT 5 APPLICATIONS

9 Hrs.

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - An ability to identify, analyze the search algorithm for the AI problems.
- CO2 - Represent a problem using first order logic.
- CO3 - Provide the knowledge based agent to solve the problem.
- CO4 - Understand the Informed search strategies.
- CO5 - Apply the baye's rule to solve the problem for societal concern.
- CO6 - Design user centric applications that use AI concepts.

TEXT / REFERENCE BOOKS

1. Stuart J.Russel, Peter Norvig, "Artificial Intelligence A Modern Approach ", 3rd Edition, Pearson Education, 2009.
2. Elaine Rich, Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2009.
3. M. Tim Jones, "Artificial Intelligence: A Systems Approach (Computer Science)", Jones and Bartlett Publishers, Inc., 1st Edition, 2008.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

PART A: 10 Questions of 2 marks each-No choice

PART B: 2 Questions from each unit with internal choice, each carrying 16 marks

Exam Duration: 3 Hrs.

20 Marks

80 Marks

- Employability

SCSA2701	CYBER PHYSICAL SYSTEMS LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To introduce basics of cyber-physical system and Industrial revolution 4.0 concepts.
- To develop an exposition of the challenges in implementing a cyber-physical system.
- To analyze the functional behaviour of CPS based on standard modeling formalisms.
- To design CPS requirements based on operating system and hardware architecture constraints.
- To understand the concepts involved in Cyber Physical Systems Security.

SUGGESTED LIST OF EXPERIMENTS

1. Study about embedded components such as sensors and actuators.
2. Study about Industrial Revolution and Cyber physical system opportunities and challenges.
3. Create a program that blinks the LED on the development board using MBED software.
4. Pick one-one from the available sensors and actuators and find or create code that will display the sensed data on the PC.
5. Create a program that displays data from the sensor in regular intervals in a compact format.
6. To Design Basic weather station using embedded components using Lab view software.
7. Login to devicehub.net and create a project then create a virtual device. Add the corresponding sensor and actuator to the virtual device.
8. Study the MQTT protocol. Examine the components of the protocol.
9. Create a connection from an MQTT capable device/software with an MQTT broker then send and receive data using it.
10. To configuring the gateways and exchange the data to local database using Dream factory.
11. To configuring the gateways and upload the data to cloud server using Dream factory or Ubidots.
12. To configuring the gateways and upload the data to cloud server using Dream factory or Ubidots.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - An ability to expose the student to real world problems in CPS and Industrial revolution 4.0 best practices.

CO2 - Identify the limitations of some computational models.

CO3 - Apply the theoretical knowledge the design of compilers.

CO4 - Student can Analyze and verify the correctness of CPS implementations against system requirements and timing constraints.

CO5 - Categorize the essential modeling formalisms of Cyber-Physical Systems (CPS).

CO6 - Implement the real time use case and problem statements.

 - Skill Development

SCSA4002	5G NETWORKS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To gain in depth knowledge of wireless networks for the future communication systems.
- To study the concepts of wireless networks for the future communication systems.
- To discuss 5G networks and its applications.

UNIT 1 MULTI-GIGABIT WIRELESS NETWORKS

9 Hrs.

Next generation (5G) wireless technologies- Upper Gigahertz and Terahertz wireless communications: Millimeter wave networking - Directionality and beam forming- Mobility and signal blockage - IEEE 802.11ad (60 GHz WLAN) MAC and PHY overview: Visible light communication- High-speed networking using LEDs - IEEE 802.15.7 PHY and MAC overview Sensing through visible light- Visible light indoor localization and positioning.

UNIT 2 INDOOR LOCALIZATION AND RF SENSING

9 Hrs.

Smartphone localization - WiFi fingerprinting - protocols and challenges - Non-WiFi localization - Device-free sensing with radio frequency - Mining wireless PHY channel state information- Device- free localization and indoor human tracking - Activity and gesture recognition through RF.

UNIT 3 LOW-POWER NETWORKING FILTERS

9 Hrs.

Backscatter communication - Radio Frequency Identification (RFID) technology overview - Energy harvesting tags and applications- Internet-of-Things (IoT) - IoT protocol overview - CoAP and MQTT - IPv6 networking in low-power PANs (6LoWPAN).

UNIT 4 FUTURE MOBILE NETWORKS

9 Hrs.

Drone networking - Multi-UAV networks, architectures and civilian applications-Communication challenges and protocols for micro UAVs- Connected and autonomous cars - Wireless technologies for Vehicle-to-Infrastructure (V2I) and Vehicle-to-Vehicle (V2V) communications - Automotive surrounding sensing with GHz and THz signals.

UNIT 5 QUALITY OF SERVICE

9 Hrs.

QoS Challenges in Wireless IP Networks - QoS in 3GPP - QoS Architecture, Management and Classes -QoS Attributes - Management of End-to-End IP QoS - EPS Bearers and QoS in LTE networks.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand the fundamental concepts of 5G networks.
- CO2 - Describe the 5G architecture and operation model.
- CO3 - Analyze the protocol support of 5G network.
- CO4 - Design IoT based applications with 5G network.
- CO5 - Describe the future mobile networks.
- CO6 - Implement 5G network with simulation.

TEXT / REFERENCE BOOKS

- 1 Wireless Communications: Principles and Practice, by Theodore S. Rappaport, Prentice Hall., 2014
- 2 802.11n: A Survival Guide, by Matthew Gast, O'Reilly Media.
- 3 802.11ac: A Survival Guide, by Matthew Gast, O'Reilly Media.
- 4 Wireless Networking Complete, by Pei Zheng et al., Morgan Kaufmann.
- 5 Zhang, Yin, Chen, Min, "Cloud Based 5G Wireless Networks", Springer, 2016
- 6 Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", Wiley 2015.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each-No choice

20 Marks

PART B: 2 Questions from each unit with internal choice, each carrying 16 marks

80 Marks

SCSA3011	HARDWARE INTERFACES AND ITS APPLICATION	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the components on the motherboard.
- To understand different storage media.
- Install and Repair computer system.
- Install Network devices, configuration, optimization.
- Understand the features of different I/O peripheral devices and their interfaces.

UNIT 1 INTRODUCTION TO PC AND MEMORY

9 Hrs.

Evolution of Personal Computers - Overview of Systems and Components - Processor Modes - Modern CPU Concepts - Architectural Performance Features - Intel Core X-Series Processor - CPU Over Clocking - Essential Memory Concepts - Memory Packages - Logical Memory Organizations - Memory Considerations - Memory Types - SSD - OPTANE Memory - Memory Techniques - Selecting and Installing Memory - CPU Coolers.

UNIT 2 MOTHERBOARD DESIGNS

9 Hrs.

Motherboard Form Factors - IBM PC XT - IBM PC AT - The Baby AT - Micro-AT - LPX and Mini-LPX - ATX - Mini-ATX - NLX - Active Motherboards - Sockets and Expansion Slots - DIMM.2 - M.2 Expansion Card - PCIe GEN3 M.2 - Intel D850GB - Upgrading a Mother Board - DDR4 BOOST - Chipsets - Intel - Non-Intel Chipsets - North Bridge - South Bridge - CMOS - Motherboard BIOS - RGB Headers - Live Dash OLED - NEXT GEN Connectivity 802.11 AD WIFI - USB 3.1 GEN2 Controller.

UNIT 3 POWER SUPPLIES AND STORAGE DEVICES

9 Hrs.

Power Supplies and Power Management - Modular - Non-Modular - Concepts of Switching Regulation - Potential Power Problems - Power Management - The Floppy Drive - Magnetic Storage - Floppy Drive - Hard Drive - SSD - CD-ROM Drive - DVD-ROM - DVD Media - DVD Drive and Decoder.

UNIT 4 I/O PERIPHERALS AND BUS ARCHITECTURE

9 Hrs.

Parallel Port - Signals and Timing Diagram - IEEE1284 Modes - Asynchronous Communication - Serial Port Signals - Video Adapters - Mice - Keyboards - Sound Cards - ISA - PCI - AGP

UNIT 5 NETWORK COMPONENTS

9 Hrs.

Introduction of Network Cable - Ethernet Cable - FIBER Optics - HUB - Unmanageable Switch - Manageable Switch - Router - Modem - Wi-Fi - Access Point - PCI Wireless Card - USB Wireless Device - Print Server.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Explain the relationship between hardware and software.
- CO2 - Classify and explain the function of different computer hardware components.
- CO3 - Understand purpose and functions of networking.
- CO4 - Understand the purpose and functions of the computer peripherals.
- CO5 - Understand diagnostic procedures and troubleshooting techniques to personal computers, portable devices, operating systems and computer peripherals.
- CO6 - Simulate various Hardware interfaces.

TEXT / REFERENCE BOOKS

1. Stephen J Bigelow, "Trouble Shooting, maintaining and Repairing PCs", Tata McGraw-Hill.
2. Ron Gilster, "PC Hardware: A Beginner's Guide", Tata McGraw-Hill.
3. Craig Zacker and John Rourke, "The complete reference: PC hardware", Tata McGraw-Hill.
4. Mike Meyers, "Introduction to PC Hardware and Troubleshooting", Tata McGraw-Hill.
5. B.Govindarajulu, "IBM PC and Clones hardware trouble shooting and maintenance", Tata McGraw-Hill.

- Entrepreneurship

SCSA3008	DISTRIBUTED DATABASE AND INFORMATION SYSTEMS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the role of databases and database management systems in managing organizational data and information.
- To understand the techniques used for data fragmentation, replication and allocation during the distributed database design process.
- To discuss the issues involved in resource management and process.
- To Perceive the building blocks and design of information systems.
- To acquire knowledge of information systems on Business operations.

UNIT 1 INTRODUCTORY CONCEPTS AND DESIGN OF (DDBMS)

9 Hrs.

Data Fragmentation - Replication and allocation techniques for DDBMS - Methods for designing and implementing DDBMS - designing a distributed relational database - Architectures for DDBMS - Cluster federated - parallel databases and client server architecture - Overview of query processing.

UNIT 2 DISTRIBUTED SECURITY AND DISTRIBUTED DATABASE APPLICATION TECHNOLOGIES

9 Hrs.

Overview of security techniques - Cryptographic algorithms - Digital signatures - Distributed Concurrency Control - Serializability theory - Taxonomy of concurrency control mechanisms - Distributed deadlocks - Distributed Database Recovery - Distributed Data Security - Web data management - Database Interoperability.

UNIT 3 ADVANCED IN DISTRIBUTED SYSTEMS

9 Hrs.

Authentication in distributed systems - Protocols based on symmetric cryptosystems - Protocols based on asymmetric cryptosystems - Password-based authentication - Unstructured overlays - Chord distributed hash table - Content addressable networks (CAN) - Tapestry - Some other challenges in P2P system design - Tradeoffs between table storage and route lengths - Graph structures of complex networks - Internet graphs - Generalized random graph networks.

UNIT 4 FUNDAMENTALAS OF INFORMATION SYSTEMS

9 Hrs.

Defining information – Classification of information – Presentation of information systems – Basics of Information systems – Functions of information systems – Components of Information systems- Limitations of Information systems – Information System Design.

UNIT 5 ENTERPRISE COLLOBRATION SYSTEMS

9 Hrs.

Groupware – Types of groupware – Enterprise Communication tools – Enterprise Conferencing tools – Collaborative work management tools – Information System for Business operations – transaction processing systems – functional Information Systems – Decision Support systems – Executive Information systems – Online Analytical processing.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Identify the introductory distributed database concepts and its structures.
- CO2 - Produce the transaction management and query processing techniques in DDBMS.
- CO3 - Develop in-depth understanding of relational databases and skills to optimize database performance in practice.
- CO4 - Critiques on each type of databases.
- CO5 - Analyse, Design and present the information systems.
- CO6 - Designing of decision support system and tools for Business operations.

TEXT / REFERENCE BOOKS

1. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems Concepts and Design", 5th Edition, Pearson Education Asia, 2012.
2. Ajay D. Kshemkalyani, MukeshSinghal, "Distributed Computing: Principles, Algorithms, and Systems", Cambridge University Press, 2008.
3. Distributed Databases - Principles and Systems; Stefano Ceri; Guiseppe Pelagatti; Tata McGraw Hill; 2006.
4. Ralph Stair and George Reynolds. , "Principles of Information Systems" Course Technology, Inc.,2006.

- Employability

SCSA5101	ADVANCED DATA STRUCTURES AND ALGORITHMS	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To understand and analyze fundamental data structures, such as binary search trees, disjoint sets, and self-adjusting lists.
- Understand the implementation and complexity analysis of fundamental algorithms such as RSA, primarily testing, max flow, discrete Fourier transform.
- Will be exposed to algorithmic issues in a variety of areas, including linear programming and game-theory.

UNIT 1 INTRODUCTION TO ALGORITHMS

9 Hrs.

Role of Algorithms in computing- Analyzing algorithm- Designing algorithm- Asymptotic Notations- Summations -Formulas and properties- Recurrences. SORTING TECHNIQUES: Heap sort – Quick sort-Radix sort- Bucket sort- Analysis of sorting algorithms.

UNIT 2 TREE STRUCTURES

9 Hrs.

Binary Search Trees- AVL Trees- Red-Black Trees- B-Trees-Splay Trees - HEAP STRUCTURES: Min/Max heaps- Leftist Heaps- Binomial Heaps- Fibonacci Heaps.

UNIT 3 MULTIMEDIA STRUCTURES

9 Hrs.

Segment Trees- k-d-trees-Point Quad Trees-MX-Quad Trees-R-Trees-TV-Trees.

UNIT 4 PROBLEM SOLVING TECHNIQUES

9 Hrs.

Branch and Bound-NP hard and NP complete problems-Huffman Coding-Activity Networks-Flow Shop Scheduling- Randomized Algorithms. ALGORITHMS: Greedy Algorithms-Backtracking-Dynamic programming- Divide and Conquer.

UNIT 5 GRAPH ALGORITHMS

9 Hrs.

Graph Representation-BFS-DFS-Topological Sort-Connected Components-Minimum Spanning Trees— Kruskal's Algorithm - Prim's Algorithm – Dijkstra's Algorithm – Floyd's Algorithm – Bellman Ford Algorithm.

Max. 45 Hrs.

TEXT / REFERENCE BOOKS

1. Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, "Introduction to Algorithms", PHI, 2002.
2. Sara Baase, Allen R. Gold, "Computer Algorithms and Introduction to Design and Analysis", Pearson, 2000.
3. Sahni, "Data Structures algorithm and application in C++", PHI, 2000.
4. Mark Allen Weiss, "Data Structures and Algorithms in C++", Addison Wesley, 3rd Edition.
5. Aho A.V., Hopcroft J.E. and Ullman J.D., "Design and analysis of Computer algorithms".

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice

30 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 14 Marks

70 Marks

- Employability

SCSA5102	DATABASE TECHNOLOGIES	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To give students in depth information about system implementation techniques, data storage, representing data elements, database system architecture.
- Demonstrate principles of design, development and administration relevant to Oracle database technology.
- Formulate a working definition of database development and administration.
- To understand the emerging databases like Mobile, Multimedia, Cloud and Big Data and Hadoop infrastructures.

UNIT 1 INTRODUCTION

9 Hrs.

Data base system Architecture - Query Optimization Techniques - Transaction Management: Transaction Processing Concepts - Concurrency Control - Recovery Techniques -Database Security.

UNIT 2 PARALLEL DBMS

9 Hrs.

Architecture-Query evaluation-Query optimization-parallelizing Individual operations. Distributed DBMS: Architecture-storing data-Cataloguing-Query processing-Transactions Concurrency and Recovery.

UNIT 3 MOBILE DATABASES

9 Hrs.

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models -Concurrency Control - Transaction Commit Protocols

UNIT 4 OBJECT AND MULTIMEDIA DATABASE SYSTEMS

9 Hrs.

Object Databases-Advantages and disadvantages compared to Relational Databases- Abstract data types, Objects identity and reference types- Inheritance Database design for ORDBMS ODMG data model and ODL OQL.MULTIMEDIA DATABASES: Nature of Multimedia data and applications Data management issues- Components of Multimedia database management system.

UNIT 5 BIGDATA AND HADOOP

9 Hrs.

Big Data-Introduction-Technologies-Reference Architecture- Hadoop- Introduction to Hadoop Distributed File System-Design of HDFS-HDFS Concepts-Interfaces for Hadoop File System-Map Reduce -weather Dataset-Analyzing the data with Hadoop-Anatomy of Map Reduce Job Run.

Max. 45 Hrs.

TEXT / REFERENCE BOOKS

1. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", 3rd Edition McGraw Hill Publications.
2. Korth.H.F. and A.Silberschatz, "Data base system concepts", 3rd Edition, McGraw Hill Publications.
3. Ramez Elmasri and B.Navathe:"Fundamentals of Database Systems", 5th Ed., Addison Wesley, 2008.
4. Stenfro Ceri and Gieuspepelagatti, "Distributed database-principles and systems", 3rd Edition.
5. O'Reilly, "Hadoop-The Definitive Guide", O'Reilly Media.
6. <http://www.oracle.com/technetwork/topics/entarch/articles/info-mgmt-big-data-ref-arch-1902853.pdf>
7. <http://www.comptechdoc.org/independent/database/basicdb/dataobject.html>.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each - No choice

30 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 14 Marks

70 Marks

 - Employability

SCSA5103	SOFTWARE QUALITY ASSURANCE AND TESTING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To introduce the basics and necessity of software testing.
- To introduce various testing techniques along with software production.
- To introduce the concepts of Software quality and its assurance.

UNIT 1 INTRODUCTION

9 Hrs.

Software testing fundamentals-objectives-principles-Testability-Levels of testing-TMM- Characteristics of a tester-A testing group-Comparison of KPA in ISO,CMM and TMM-Software quality attributes.

UNIT 2 SOFTWARE TESTING METHODS AND STRATEGIES

9 Hrs.

Test case design-White box testing- Basic path testing-Flow Graph Notation-Cyclomatic Complexity-Deriving Test Cases-Graphic matrices-Control Structure Testing-Deriving Test cases-Dataflow Testing-Loop Testing-Black box Testing-Graph Based Testing Methods-Equivalence partitioning-Boundary value analysis-Comparison testing. Strategic Approach to Software Testing-Verification and Validation-Strategic issues-Unit testing-Consideration Procedures. Integration Testing-Regression Testing- Integration Test Documentation-Validation testing-Configuration Review-Alpha and Beta Testing System Testing-Art of Debugging. Case studies: Writing test cases for white box and black box testing.

UNIT 3 OBJECT ORIENTED TESTING, METRICS AND MEASUREMENTS

9 Hrs.

Testing OOD Models-OO Testing Strategies-Test Case Design for OO Software-Testing Methods applicable at the class level-Inter class test design-The intent of OO metrics-Distinguishing characteristics of OO metrics. Common software measurements: Code coverage-Cohesion-Comment density, Coupling-Function point analysis- Number of classes and interfaces-Number of lines of customer requirements-Robert Cecil Martin's software package metrics-Bugs per line of code-Source lines of code.

UNIT 4 QUALITY CONSIDERATIONS

9 Hrs.

Planning for quality – Quality plan – Cost/benefit tradeoff – Feature/bug tradeoff – Modeling quality improvement-Notation of defects-Detects-Defect removal activities-Conditions for each activity-Defect removal goals-Quality improvement teams-quality recognition-Manage Priorities Effectively-Statistical Quality Assurance-Software Reliability.

UNIT 5 OVERVIEW OF STANDARDS

9 Hrs.

Levels of standards-Quality assurance standards-Project management standards-Dependability standards-Product standards-Process standards-ISO9000-Reviews,Audits and Certification.

Max. 45 Hrs.

TEXT / REFERENCE BOOKS

1. Ilene Barnstein,"Practical Software Testing-A Process Oriented Approach", Springer International Edition.
2. Humphrey, W.S. (2002), "A Discipline for Software Engineering. Reading, MA", Addison-Wesley.
3. Roger S.Pressman, "Software Engineering, A Practitioner's Approach", Tata McGraw Hill, 5th Edition.
4. Marc Roper, "Software Testing", McGraw Hill Professional, 1994.
5. Ian Sommerville, "Software Engineering", Addison-Wesley, 5th Edition, 1996.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice

30 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 14 Marks

70 Marks

 - Employability

SCSA5104	NETWORK TECHNOLOGIES AND PROTOCOLS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand how routing is done in telephone networks.
- To learn about the different internet routing protocols.
- To appreciate the different aspects routing in optical and mobile networks.
- To understand the issues in adhoc networks, the protocols used for the working of adhoc networks.

UNIT 1 INTRODUCTION

9 Hrs.

ISO OSI Layer Architecture-TCP/IP Layer Architecture – Functions of Network layer-General Classification of routing-Routing in telephone networks-DynamicNon Hierarchical Routing(DNHR)-Trunk status map routing (TSMR)-Real-time network routing(RTNR)-Distance vector routing-Link state routing-Hierarchical routing.

UNIT 2 WIRED LINE AND WIRELESS NETWORKS

9 Hrs.

LAN IEEE802 Projects-Ethernet-Token Ring-FDDI-MAN-DQDB-SMDS-Wireless LAN-IEEE 802.11-WiFi-SONET - DWDM-DSL-Switching-Circuit Switching-Packet switching Intelligent Networks-LAN bridges.

UNIT 3 INTERNET ROUTING PROTOCOLS

9 Hrs.

Interior routing protocols: Routing Information Protocol (RIP) - Open Shortest Path First (OSPF) – Exterior Routing protocols: Exterior Gateway Protocol(EGP) and Border Gateway Protocol(BGP).Multicast routing :Pros and cons of Multicast and Multiple Unicast Routing - Distance Vector Multicast Routing Protocol (DVMRP) - Multicast Open Shortest Path First(MOSPF) MBONE.

UNIT 4 ADVANCED NETWORKS CONCEPTS

9 Hrs.

Use of FEC - Traffic Engineering and MPLS based VPN - Overlay Networks - P2P Connections - IPv4 vsIPv6.

Max. 45 Hrs.

UNIT 5 TELE COMMUNICATION AND CELLULAR NETWORKS

9 Hrs.

Telecommunication systems-GSM-Services-Architecture-Protocols-Handover-DECT-Architecture-Protocols-Handovers- TETRA-Bluetooth Technology-GPRS-WAP-WAP Architecture-WAP Protocols- WLL.

TEXT / REFERENCE BOOKS

1. William Stallings, "High-Speed Networks and Internets, Performance and Quality of Service", 2nd Edition, Pearson Education Asia, Reprint India, 2002.
2. Martha Steens trup, "Routing in Communication Networks", Prentice Hall International, New York, 1995.
3. Leon Garcia.Widjaja,"Communication Networks", Tata McGraw-Hill, 6th Edition, 2002.
4. Aunurag Kumar, D.Manjunath, Joy Kuri, "Communication Networking", Morgan Kaufmann Publishers, 2011.
5. Jochen Schiller, "Mobile Communications", 2nd Edition, Pearson Education, 2008.
6. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing: Technology, Applications and Service Creation", 2nd Edition, Tata McGraw Hill, 2010.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice

30 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 14 Marks

70 Marks

- Employability

SCSA5105	ADVANCED OPTIMIZATION TECHNIQUES	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To learn linear and non linear programming problem.
- To understand the concept of queuing model, simulation and decision theory.

UNIT 1 INTRODUCTION TO OPTIMIZATION

9 Hrs.

Formulation of optimization problem- Simplex Method - Big M Method - Two phase method - Dual Simplex method - Integer Programming- Gomory All Integer cutting plane Method-Gomory Mixed Integer Method-Branch and Bound Method

UNIT 2 NON LINEAR PROGRAMMING

9 Hrs.

Introduction – Unconstrained and Constrained Optimization- Kuhn Tucker conditions- Relative Maximum and Minimum values- Method of Lagrangian Multipliers- Hessian Matrix- Quadratic programming- Wolfe's Modified Simplex Method – Problems

UNIT 3 DYNAMIC PROGRAMMING

9 Hrs.

Recursive relationship - Solution to recursive equation - Dynamic Programming Algorithm - Principle of Optimality - Maximum and minimum values - Solution of LPP by Dynamic Programming - Multi stage problem

UNIT 4 QUEUEING NETWORKS

9 Hrs.

Introduction to Concept of Queuing Models - Single Server - Multiple server Models - Problems - Pollaczek Khinchine theorem. Theoretical concepts of Open queuing networks (Theory) - Closed Queuing Networks (Theory) - Queues in series (Theory).

UNIT 5 DECISION ANALYSIS AND SIMULATION

9 Hrs.

Introduction to Decision Making process – Elements – Decision making under uncertainty – Maximin and Maximax criteria- Hurwitz criterion – Laplace criterion – Minimax Regret criterion – Decision tree analysis- Problems - Simulation - Nature and need for simulation - Monte Carlo method – Applications to Queuing systems.

Max. 45 Hrs.

TEXT / REFERENCE BOOKS

1. J.K. Sharma, "Operations Research Theory and Applications", 4th Edition, Macmillan India Ltd., 2010.
2. F.S.Hillier & G.J. Lieberman, "Introduction to Mathematical Programming", McGraw Hill International Edition.
3. H.A.Taha "Operations Research: An Introduction", 6th Edition, Macmillan.
4. Prem Kumar Gupta and D.S. Hira, "Operations research", S Chand, 2000.
5. Sharma .S.D, "Operations Research", Kedarnath Ramnath & Co, 2002.
6. Gupta. P.K and Man Mohan "Problems in Operations Research", Sultan Chand and Sons, 7th Edition, 1995.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice

30 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 14 Marks

70 Marks

 - Employability

SCSA6101	ADVANCED DATA STRUCTURES AND ALGORITHMS LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To understand and analyze some fundamental data structures, such as binary search trees, disjoint sets, and self-adjusting lists.
- To understand the implementation and complexity analysis of fundamental algorithms such as RSA, primality testing, max flow, discrete Fourier transform.
- To know about algorithmic issues in a variety of areas, including linear programming and game-theory.
- To understand and implement linear and non linear data structures in real time.
- To analyze the design of algorithms using various performance metrics.

SUGGESTED LIST OF EXPERIMENTS

1. Polynomial Differentiation.
2. Printing the node details level wise.
3. Searching the given element from N*N matrix using Binary search.
4. Knapsack Problem using Greedy Method.
5. Traveling salesman Problem.
6. Binary Tree Traversal.
7. Implementing RED BLACK Trees.
8. Minimum Spanning Tree using KRUSKAL'S Algorithm.
9. Minimum Spanning Tree using FLOYD - WARSHALL Algorithm.
10. Implementing Splay trees.
11. Implementing quad trees.

 - Skill Development

SCSA5201	COMPUTATIONAL INTELLIGENCE	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To understand the concepts, paradigms, algorithms and implementation of CI and its constituent methodologies.
- To emphasize on practical applications throughout, that is, how to apply the concepts, paradigms, algorithms and implementations discussed to practical problems in engineering and computer science.
- To introduce the basic tools and techniques in Computational Intelligence such as Neural Networks and Genetic algorithms.
- To analyze algorithms from an application perspective to the students.

UNIT 1 ARTIFICIAL NEURAL NETWORKS

9 Hrs.

The Artificial Neuron - Supervised Learning Neural Networks-Supervised Learning rules -Unsupervised Learning Neural Networks-Reinforcement Learning-Learning through awards-Model free Reinforcement Learning- Performance Measures-Performance Factors.

UNIT 2 EVOLUTIONARY COMPUTATION

9 Hrs.

Introduction to Evolutionary Computation-Genetic Algorithms-Genetic Programming-Basic Evolutionary Programming-Generic Evolution Strategy Algorithm-Basic Differential Evolution-Basic Cultural Algorithm- Belief Space-Convolution-Applications of various evolutionary computation techniques.

UNIT 3 SWARM INTELLIGENCE

9 Hrs.

Basic Particle Swarm Optimization-Social Network Structures-Basic Variations-Basic PSO Parameters-Ant Colony Optimization-Ant Algorithms-Simple Ant Colony Optimization Algorithm-Ant System-Ant Colony System- Max-Min Ant System-Basic Artificial Bee Colony Algorithm.

UNIT 4 ARTIFICIAL IMMUNE SYSTEMS

9 Hrs.

Natural Immune System-Learning the Antigen Structure-Artificial Immune System Algorithm-Classical View Models-Clone Selection Theory Models-Network Theory Models-Artificial Immune Network-Adapted artificial Immune Network.

UNIT 5 FUZZY SYSTEMS

9 Hrs.

Fuzzy Sets-Fuzzy Logic and Reasoning-Fuzzy Inferencing- Fuzzy Controllers-Mamdani Fuzzy Controller-Takagi- Sugeno Controller-Introduction to Rough sets.

Max. 45 Hrs.

TEXT / REFERENCE BOOKS

1. Andries P Engelbrecht, "Computational Intelligence", Wiley Publications, 2nd Edition.
2. Leszek Rutkowski, "Computational Intelligence Methods and Techniques"- Springer 2008.
3. Lakhmi C.Jain, "Computational Intelligence Paradigms Innovative Applications" – Springer 2008.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice

30 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 14 Marks

70 Marks

- Employability

SCSA5202	WIRELESS SENSOR NETWORKS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To provide awareness about challenges wireless sensor networks.
- To acquire knowledge of various networking sensors.
- To comprehend the infrastructure establishment.
- To discuss sensor network platforms and tools.

UNIT 1 NETWORK ARCHITECTURE

9 Hrs.

Concept of sensor network – Introduction, Applications, Sensors. Single Node Architecture: Hardware and software component of a sensor node-Tiny OS operating system-C language. Wireless Sensor Network architecture: Typical network architectures-Data relaying strategies Aggregation-Role of energy in routing decisions.

UNIT 2 MAC LAYER

9 Hrs.

MAC Layer Strategies: MAC Layer Protocols-Scheduling Sleep Cycles-Energy Management-Contention Based Protocols-Schedule Based Protocols, 802.15.4 Standard. Naming and Addressing: Addressing Services - Publish-Subscribe Topologies. Clock Synchronization: Clustering For Synchronization-Sender-Receiver-Receiver Synchronization-Error Analysis. Power Management – Per Node -System-Wide-Sentry Services-Sensing Coverage.

UNIT 3 NODE LOCALIZATION AND DATA GATHERING

9 Hrs.

Node Localization: Absolute and Relative Localization-Triangulation-Multi-Hop Localization and Error Analysis-Anchoring - Geographic Localization-Target Tracking - Localization and Identity Management-Walking GPS-Range Free Solutions. Data Gathering - Tree Construction Algorithms and Analysis - Asymptotic Capacity- Lifetime Optimization Formulations- Storage and Retrieval. Deployment & Configuration - Sensor deployment, scheduling and coverage issues-Self configuration and topology control.

UNIT 4 ROUTING AND DISTRIBUTED COMPUTATION

9 Hrs.

Routing: Agent-Based Routing -Random Walk-Trace Routing Data Centric-Hierarchical - Location-Based – Energy Efficient Routing Querying-Data Collection And Processing-Collaborative Information Processing And Group Connectivity.

UNIT 5 SENSOR NETWORK TOOLS

9 Hrs.

Sensor Network Platforms and Tools: Sensor node hardware- Programming challenges-Node level software platform-Node level simulators-Programming beyond individual nodes-Security-Privacy issues-Attacks and counter measures.

Max. 45 Hrs.

TEXT / REFERENCE BOOKS

1. Feng Zhao and LeonidasJ Guibas, "Wireless Sensor Networks" Morgan Kaufmann Publishers, Elsevier, 2004.
2. Raghavendra C.S., Krishna M.Sivalingam, Taieb F.Znati, "Wireless Sensor Networks", 2nd edition, Springer, 2004.
3. Holger Karl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley and Sons, 2005.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice

30 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 14 Marks

70 Marks

SCSA5301	INTERNET OF THINGS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the concept of Internet of Things.
- To identify the various elements of an IoT System.
- To understand the various means of communication from Node / Gateway to Cloud Platforms.
- To understand Cloud Computing & its relevance in IoT.
- To identify types of data analytics and data visualization tools.
- To make students aware of security concerns and challenges while implementing IoT solutions.

UNIT 1 INTRODUCTION TO IOT

9 Hrs.

Introduction to IoT - Current technological trends and future prospects - Evolution of IoT- Business Scope - Relation with embedded system - Basic Architecture of an IoT - From M2M to IoT - M2M towards IoT - IoT Value Chains - An emerging industrial structure for IoT.

UNIT 2 ELEMENTS OF IOT

9 Hrs.

Application Sensors and Actuators - Edge Networking (WSN) – Gateways - IoT Communication Model – WPAN and LPWA - Overview of IoT supported Hardware platforms such as: Raspberry pi - ARM Cortex Processors - Arduino and Intel Galileo boards - Wearable Development Boards.

UNIT 3 COMMUNICATION AND CONNECTIVE TECHNOLOGIES

9 Hrs.

IoT Communication Model - Cloud computing in IoT - IoT in cloud architecture - Logging on to cloud - Selecting and Creating cloud service - cloud based IoT platforms - IBM Watson - Google cloud.

UNIT 4 DATA ANALYTICS AND IOT PLATFORM

9 Hrs.

Big Data Analytics - Apache Hadoop - Using Hadoop Map Reduce for Batch Data Analysis - Apache Storm - Data Visualization - Visualization tools for IoT.

UNIT 5 HANDS-ON PROJECTS

9 Hrs.

Industry 4.0 concepts - Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino) - DIY Kits – Soil moisture monitoring - Weather monitoring - Air quality Monitoring - Movement Detection.

Max. 45 Hrs.

TEXT / REFERENCE BOOKS

1. The Internet of Things: Applications and Protocols, Wiley publications. Author(s): Oliver Hersent, David Boswarthick, Omar Elloumi.
2. Architecting the Internet of Things, Springer publications. Author(s): Dieter Uckelmann, Mark Harrison, Florian Michahelles.
3. Internet of Things with Arduino Cookbook, Packt Publications. Author(s): Marco Schwatz.
4. Internet of Things and Data Analytics, Wiley Publications.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice

30 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 14 Marks

70 Marks

 - Employability

SCSA5302	GREEN COMPUTING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To study the existing green computing strategies, fundamental challenges in achieving green operations of computing units and directions to solve some of them.
- To acquire expertise for improving the energy efficiency of personal computers by reducing the power consumption requirements.
- To study the regulatory and governance issues surrounding IT industry.

UNIT 1 GREEN COMPUTING FUNDAMENTALS

9 Hrs.

Information Technology and Environment - Business and Environment - Green Enterprise Characteristics- Green Vision- Green Strategic Points-Green Value-Green IT Opportunity-Environmental Intelligence-Business Intelligence-Envisioning the Green Future.

UNIT 2 GREEN IT STRATEGIES AND ASSETS

9 Hrs.

Introducing Green IT Strategies- Green IT Drivers- Green IT Business Dimensions- Green IT Metrics and Measurements- Green IT Readiness and CMM- Green Assets- Buildings- Green IT Hardware- Green Data Centers- Data servers Optimization and Virtualization- cloud Computing and Data Centers- Networking and Communication Infrastructure- Managing Devices for Central Green Services.

UNIT 3 SOCIOCULTURAL ASPECTS OF GREEN IT

9 Hrs.

Green IT's Social Impact – Green Socials take holders – Role based view of Green IT- Green User practices- Attitude and Subjectivity in Green IT- Green IT Ethics and Code Conduct – Privacy and security of green Information -Green IT project - Green HR and Changing Organization Structures - Green Virtual Communities.

UNIT 4 EMERGENT CARBON ISSUES-TECHNOLOGIES AND FUTURE

9 Hrs.

Future Carbon Landscape - Green ICT and Technology Trends - Cloud Computing – SaaS – Nanotechnologies- Quantum Computing – Eco design – Biomimicry - New Renewable Energies – Green ICT- Business and Economic Trends.

UNIT 5 CASE STUDIES

9 Hrs.

Applying Green IT Strategies and Application to a Hospital - Packing Industry and Telecom Sector.

Max. 45 Hrs.

TEXT / REFERENCE BOOKS

1. Bhuvan Unhelkar, "Green IT Strategies and Applications: Using Environmental Intelligence", CRC Press, 2011 ISBN 978-1- 4398-3760.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Green IT-Reduce Your Information System's Environmental Impact While Adding to the Bottom Line "First Edition, Anthony T. Velele, Robert Elsenpeter, Publisher: McGraw-Hill, 2008, ISBN: 978-0- 07-159923-8, Pages: 307.
3. John Lamb, "The Greening of IT-How Companies Can Make a Difference for the Environment", Publisher: IBM Press, 2009, ISBN: 978-0-13-715083-0.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice

30 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 14 Marks

70 Marks

 - Employability

SCSA6301	INTERNET OF THINGS LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To identify the different technologies and different platforms in IoT
- To understand how to use sensors and actuators for design of IoT.
- To learn different protocols used in IOT.
- To learn the concepts of smart city development in IOT.
- To learn how to analysis the data in IOT.

SUGGESTED LIST OF EXPERIMENTS

1. Monitor the soil moisture level using Raspberry pi.
2. Monitor the surrounding air's quality using Arduino & sensors connected to a Raspberry Pi.
3. Implement Raspberry Pi as a local server by installing Apache, PHP, and MySQL.
4. Interface PIR sensor with ESP8266 WiFi module on NodeMCU platform.
5. Posting temperature and humidity of the environment to Thing speak cloud service using NodeMCU.
6. Implement Raspberry Pi Temperature System with Ubidots cloud service.
7. Implement smart cities Sensor Board v3.0 using Wasp mote platform for measuring temperature, humidity and pressure
8. Measure light intensity and pollution level using Wasp mote platform.
9. Receiving and storing data in Meslium gateway for Wasp mote platform.
10. Implement barometric pressure monitoring using BMP280 sensor for Zolertia module.

 - Skill Development