



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 AND ENGINEERING

Minutes of Meeting

Date: 21.04.2023 **Time:** 10 AM

Venue: Board Room, St.Paul's Block

Agenda:

- Review of Regulations 2023 curriculum and Syllabus.
- Inclusion of System Programming and Advanced Computer Networks courses as professional electives for academic year 2023-2024. This is an industry elective offered by HCL.

Minutes

The BOS meeting was held on April 21, 2023, to review the curriculum and syllabi of the School of Computing for the Regulations 2023.

The HOD greeted and welcomed all the Board of Studies members. The Dean, HOD and the faculty members of CSE attended the meeting and interacted with the expert members.

The experts reviewed the curriculum and approved the same.

They commended the incorporation of industrial electives to the programme. SBAA4004 Venture Creation-NEN has been included in the curriculum.

Convener: Dr. T.Sasikala, Dean School of Computing

External Members:

Academic Expert

- Dr.T.G.Sambanthan, Professor & Head, Department of Computer Science & Engineering NITTTR, Chennai.

Industry Experts

- Dr.V.Sankaran, Program Manager, Engineering and R&D Services, HCL Technologies

- Mr. Ajay Kumar, CTO, Cognibot Robotics, Chennai.



Alumni

- Mr. Johnson S, Project Test Manager, TCS , Chennai.
- Mr. Ashish Chopra, Senior BDE, Freshworks, Chennai.



Internal Members:

- Dr.L. Lakshmanan, HoD, Department of CSE
- Dr. S.Murugan, Professor, Department of CSE
- Dr. Prem Jacob, Professor, Department of CSE
- Dr. Usha Nandini, Associate Professor, Department of CSE
- Dr. Ramya Franklin, Associate Professor, Department of CSE


Dean-SOC

SCSB3038	ADVANCED COMPUTER NETWORKS	L	T	P	EL	Credits	Total Marks
		2	0	2	0	3	100

COURSE OBJECTIVES

- To introduce topics related to computer networks and internet operating system.
- To gain knowledge on how to develop products.
- To understand basics of Linux kernel architecture where the network devices based on and its interface with various products developed for these devices.

UNIT 1 LINUX KERNEL

9 Hrs.

Linux kernel programming introduction - Static and dynamic linking of modules - User vs kernel space - Systems calls - Makefile for modules. Shell Programming.

Practical: Write shell programs related to shell function - line count of several files and wait and sleep commands.

UNIT 2 NETWORK DRIVERS

9 Hrs.

Introduction to Network device drivers - Character device driver development - Process synchronization and scheduling - Interrupt handling - Kernel debugging.

Practical: Write a kernel program - compiling and inserting and removing a module in kernel

UNIT 3 eBPF - NETWORKING AND SECURITY

9 Hrs.

Basics of eBPF - Packet filters basics - Introduction to kernel's traffic control layer - Use of C for eBPF

Practical: Write a simple C program to interact with eBPF using syscall.

UNIT 4 NETWORK OPERATING SYSTEM PROGRAMMING MODULE

9 Hrs.

Introduction to Internet Operating System. Basics of Cisco IOS XR7 - Cisco IOS and Open Network Linux. Socket basics - Basics of client-server architecture - Basics of overlay networking and virtualization - Content delivery networks and network automation.

Practical: Write a simple C program on SNULL (Simple Network Utility for Loading Localities).

Write a C program to capture network packets.

UNIT 5 NETWORK DRIVERS TESTING

9 Hrs.

Socket basics - Loopback addressing - Structure of SNULL (Simple Network Utility for Loading Localities).

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Understand the fundamentals of Linux Kernel architecture.
- CO2** - Develop products related to advanced computer networks.
- CO3** - Deep knowledge in structure of networks to the protocol content and usage level.
- CO4** - Understand the internet operating systems running in routers and switches.
- CO5** - Develop products run in these networks and network devices.
- CO6** - Test and maintain the products run in the networks.

TEXT / REFERENCE BOOKS

1. Robert Love, "Linux Kernel Development", 3rd edition, Addison Wesley, 2010.
2. Andrew S.Tanenbaum, David J.Wetherall, "Computer Networks", 5th Edition, Pearson, 2019.
3. M J Bach, "The Design of the Unix Operating System", 1st Edition, Pearson Education, 2015.
4. J Cooperstein, "Writing Linux Device Drivers - A Guide with Exercises", Createspace, 2009.

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

 New Course

VENTURE CREATION

Overview

This course is designed to enable students to build an entrepreneurial mindset, explore the concept of entrepreneurship, Design thinking, understand the startup journey from opportunity identification to a validated MVP, build sustainable business model, Business planning & financial feasibility and creation of pitch deck.

Couse Credits: 3

Credit Structure: L-3; T-0; P-0; EI -0 C-3

Course Learning Objectives:

1. To develop an entrepreneurial mindset, understand the concept of entrepreneurship and identify personal strengths and weaknesses
2. To understand the design thinking process and apply design thinking to real-world problems
3. To identify problems and opportunities and develop ideas for new ventures by assessing market potential
4. To develop a value proposition, business model canvas, build MVP to create sustainable differentiation for the venture with a well-structured business plan, unit economics, go-to-market strategies and funding plan for managing business growth
5. To build an idea pitch and deliver it with confidence to potential stakeholders

Course Learning Outcome:

Upon completion of the course, students will be able

1. To define entrepreneurship and explain emerging trends in entrepreneurship
2. To identify and evaluate business opportunities and assess market potential
3. To conduct customer discovery, market research, build a lean canvas, develop a business plan and marketing strategies
4. To identify sources of funding and develop a funding strategy, understand basic legal requirement for starting and running a business
5. To build an idea pitch and deliver it with confidence to various stakeholders

Course Contents

Unit	Unit title	Descriptors
Unit 1	Introduction to Entrepreneurship	Defining Entrepreneurship, evolution the concept & Emerging Trends in Entrepreneurship (Domain specific), Understanding the unique opportunities; Why be an Entrepreneur? Entrepreneurship in Indian Scenario & Its role in economic development; Success stories of

		Entrepreneur (Domain specific); Entrepreneurial style assessment tool; Developing the Entrepreneurial mindset- Attributes & skills, recognizing your sweet spot for starting up; Principles of Effectuation; Myths about Entrepreneurship; Types of Entrepreneurs; Entrepreneur vs Intrapreneur; Role of Entrepreneurial Teams
Unit 2	Design Thinking & Opportunity Discovery	Introduction to Design Thinking for startups; Design Thinking principles & process; Define the problem using Design thinking principles and validate Problem; Generation of ideas, Idea generation techniques and evaluating creative ideas; Identify problem worth solving; Sharpen your Problem Pitch
Unit 3	Customer, Markets and creating a sustainable differentiation	Differentiate between a customer and a consumer; Who is your customer and what is your segment ; Customer Job, Pains, and Gains using Value proposition Canvas; Build solution using Value Proposition Canvas; Market Estimation-TAM,SAM,SOM; Competitive analysis; Minimum viable product – what is MVP: Build - Measure - Learn, differentiate between solution Demo & MVP; How to validate MVP- Achieve a Product – Market fit
Unit 4	Business Model, Business Planning and Go to Market strategies	Introduction to Business model, Business plan ; Lean approach 9 block lean canvas model; Financial feasibility: Costs, revenue streams, Pricing, Financial Projections, Key Financial Metrics using financial template, Managing growth & targeting scale, Unit economics; Selecting the Right Channel; Introduction to Digital Marketing and tools; Branding strategy
Unit 5	Funding strategy	Sources of funds: Debt & Equity ; Map the Start-up Lifecycle to Funding Options; Build an Investor ready pitch deck

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>=17, state==TN.
- Write a menu driven C program for library management system with ten entries:
 - a. (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.



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CATEGORY - 1 UNIVERSITY BY UGC



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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Minutes of Meeting

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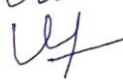
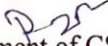
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Internal Members:

- Dr. L. Lakshmanan, HoD, Department of CSE
- Dr. S. Murugan, Professor, Department of CSE
- Dr. Prem Jacob, Professor, Department of CSE
- Dr. Usha Nandini, Associate Professor, Department of CSE
- Dr. Ramya Franklin, Associate Professor, Department of CSE


Dean-SOC

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 be 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.

Paul Gries, Jennifer Campbell, Jason Montojo, —Practical Programming: An Introduction to Computer Science using Python 3||, Pragmatic Bookshelf, 2nd Edition,2014

SCSA1104	PROBLEM SOLVING TECHNIQUES WITH C AND C++	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To learn the fundamentals of PST and methodologies which are essential for building good C/C++ programs.
- To demonstrate a thorough understanding of modular programming by designing programs which require the use of programmer-defined functions.
- To impart the knowledge about pointers which is the backbone of effective memory handling.
- To demonstrate adeptness of object oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.

UNIT 1 INTRODUCTION TO COMPUTER PROBLEM SOLVING 9Hrs.

Algorithms, building blocks of algorithms (statements, control flow, functions), notation (pseudo code, flow chart), algorithmic problem solving for socio economic conditions in global perspectives, simple strategies for developing algorithms (iteration, recursion), efficiency of algorithms.

UNIT 2 BASICS OF C PROGRAMMING 9Hrs.

Introduction to C: Features of C - Structure of C program-Data Types-'C' Tokens-Input/output statements-Control Statement, Functions: – Types of Functions –Recursion.
Algorithms: Reversing the digits of a number - Generation of Fibonacci sequence- Factorial Computation.

UNIT 3 ARRAYS, STRINGS AND STRUCTURES 9Hrs.

Arrays : Single and Multidimensional Arrays— Array as Function Arguments, Strings: String Handling Functions, Structure: Nested Structures – Array of Structures – Structure as Function Argument– Function that Returns Structure, Union.
Algorithms: Sum of array elements- Removal of duplicates from an array-Finding the Kth smallest element.

UNIT 4 POINTERS AND FILE PROCESSING 9Hrs.

Pointers: Introduction, Arrays Using Pointers – Structures Using Pointers – Functions Using Pointer, Dynamic Memory Allocation, Storage Classes, File Handling in 'C'.
Algorithms: Swap elements using Call by Reference – Sorting Arrays using pointers- Finding sum of array elements using Dynamic Memory Allocation.

UNIT 5 OBJECT ORIENTED PROGRAMMING CONCEPTS 9Hrs.

Introduction-Procedure vs. Object oriented programming concepts - Classes and Objects-Operator & Function Overloading- Inheritance-Polymorphism and Virtual Functions

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1: Develop solutions for the given problem.
- CO2: Design and Implement applications using arrays and strings.
- CO3: Develop and Implement applications using memory allocation and File concepts.
- CO4: Use proper class protection to provide security.
- CO5: Describe the reusability of code through Inheritance.
- CO6: Demonstrate the use of virtual functions to implement polymorphism.

TEXT / REFERENCE BOOKS

1. Dromey.R.G, "How to Solve it by Computer", Prentice-Hall of India, 8th Indian Reprint, 2008.
2. Aho.A.V., Hopcroft.J.E and Ullman.J.D, "The Design and Analysis of Computer Algorithms", Pearson education, 2004.
3. Brian W.Kernighan and Dennis M.Ritchie, The C Programming Language, Pearson Education, 2015.

4. Yashavant Kanetkar, Understanding Pointers in C, 4th Revised & Updated Edition, Bbp Publications, 2008.
5. E Balagurusamy, Object Oriented Programming with C++, 3rd edition, Tata McGraw Hill, 2006.
6. Bhav, Object Oriented Programming with C++, Pearson Education, 2004.
7. John R Hubbard, "Programming with C++", Schaums Outline Series, McGraw Hill, 2nd edition, 2009.
8. Bjarne Stroustrup, Programming: Principles and Practice using C++, 1st Edition, Addison Wesley Publications, 2008.

END SEMESTER EXAM QUESTION PAPER PATTERN

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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



- Deleted Content

S11BLH11	PROGRAMMING IN C	L	T	P	EL	Credits	Total Marks
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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:

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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 and 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 the 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>=17, state==TN.
- Write a menu driven C program for library management system with ten entries:
 - a. (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.

SCSA1203	DATA STRUCTURES	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To impart the basic concepts of data structures and algorithms
- To be familiar with writing recursive methods.
- To understand concepts about searching and sorting techniques.
- To implement basic concepts about stacks.
- To apply the concepts of queues and its types.

UNIT 1 INTRODUCTION TO ALGORITHMS 9 Hrs.

Introduction Data Structures - Need - classification - operations –Abstract data types (ADT) - Array - characteristics - types - storage representations. Array Order Reversal-Array Counting or Histogram- Finding the maximum Number in a Set, Recursion- Towers of Hanoi-Fibonacci series-Factorial.

UNIT 2 LINKED LISTS 9 Hrs.

Introduction - 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 - Applications of singly linked list to represent polynomial - Advantages and disadvantages of singly linked list - Circular linked list - Doubly linked list - Circular Doubly Linked List.

UNIT 3 STACKS 9 Hrs.

Basic Stack Operations - Representation of a Stack using Arrays - Algorithm for Stack Operations - Stack Applications: Reversing list - Factorial Calculation - Infix to postfix Transformation - Evaluating Arithmetic Expressions.

UNIT 4 QUEUES 9 Hrs.

Basic Queue Operations - Representation of a Queue using array - Applications of Queues - Round robin Algorithm - Enqueue - Dequeue - Circular Queues - Priority Queues.

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:** Understand the concept of recursive algorithms.
- CO2:** Demonstrate the different types of data structures.
- CO3:** Able to understand the operations on linear data structures.
- CO4:** Summarize searching and sorting techniques.
- CO5:** Choose appropriate data structure as applied to specified problem definition.
- CO6:** Understand and implement the applications of linear data structures.

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++, Prentice Hall Editin, 2004.
4. Thomas H. Cormen, Charles E. Leiserson, "Introduction to Algorithms", 3rd Edition, 2010.

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

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** - Added Content

SCSA1204	PYTHON PROGRAMMING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand why python is a useful scripting language for developers.
- To learn how to use lists, tuples and dictionaries in python programs.
- To learn how to build and package python programs for reusability.
- To learn how to read and write files in python.
- To learn how to use exception handling in python applications for error handling

UNIT 1 INTRODUCTION

9 Hrs.

History of Python- Introduction to the IDLE interpreter (shell) - Data Types - Built-in function - Conditional statements - Iterative statements- Input/output functions - Compound Data Types - Nested compound statements – Introduction to Object Oriented Concepts

UNIT 2 FILES AND EXCEPTIONS HANDLING, MODULES, PACKAGES

9 Hrs.

File Operations –Iterators - Exception handling - Regular Expressions- Creating Modules-Import Statement-Introduction to PIP-Installing Packages via PIP-Using Python Packages.

UNIT 3 GUI PROGRAMMING

9 Hrs.

GUI Programming in Python - Introduction to GUI library - Layout management - Events and bindings - Fonts – Colours
- Canvas - Widgets (frame, label, button, check box, entry, listbox, message, radiobutton, text, spinbox).

UNIT 4 DATABASE AND NETWORK

9 Hrs.

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

UNIT 5 CASE STUDY

9 Hrs.

Web Programming using Python Image Processing – Facebook Analysis – Twitter Analysis.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1:** Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in python
- CO2:** Do the decision making and write functions in Python.
- CO3:** Explain how to design GUI Applications in Python and evaluate different database operations.
- CO4:** Design and develop Client Server network applications using Python.
- CO5:** Ability to design real life situational problems and think creatively about solutions of them.
- CO6:** Apply the best features of mathematics, engineering and natural sciences to program real life problems

TEXT / REFERENCE BOOKS

2. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, 2013.
3. Paul Gries, Jennifer Campbell, Jason Montojo, "Practical Programming: An Introduction to Computer Science Using Python 3", Pragmatic Bookshelf, 2nd Edition, 2014.
4. Magnus Lie Hetland, "Beginning Python: From Novice to Professional", Apress.

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

- Deleted Content

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, 2

- Added Content

SCSA2201	DATA STRUCTURES LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To implement linear and non-linear data structures.
- To understand the different operations of search trees.
- To implement graph traversal algorithms.
- To get familiarized to sorting algorithms.
- To implement linear search and binary Search.

LIST OF EXPERIMENTS

1. Program to insert and delete an element in an array.
2. Program to implement operations on a singly linked list.
3. Program to implement operations on a doubly linked list.
4. Program to sort the elements using insertion sort.
5. Program to sort the elements using quick sort.
6. Program to sort the elements using merge sort.
7. Program to implement a Stack using an array and Linked list.
8. Program to implement Queue using an array and Linked list.
9. Program to implement Circular Queue.
10. Program to convert an infix expression to postfix expression.
11. Program to implement display elements of a queue according to their priority.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1:** Remembering the concept of data structures through ADT including List, Stack and Queues
- CO2:** Understand basic concepts about stacks, queues, lists, trees and graphs
- CO3:** Able to apply and implement various tree traversal algorithms and ensure their correctness
- CO4:** Ability to analyze algorithms and develop algorithms through step by step approach in solving problems with the help of fundamental data structures.
- CO5:** Compare and contrast Array based and Link based applications of typical data structures such as Stacks and Queues.
- CO6:** Design applications and justify use of specific linear data structures for various applications

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

- CO1** - Implement programs using array and linked list data structures by mapping it to daily pursuits.
- CO2** - Formulate programs for algorithms based on stack and queue data structure and its application.
- CO3** - Demonstrate the process of sorting that happens in daily activity by implementing various sorting algorithms.
- CO4** - Compare and contrast the difference in time and space complexity for Linear and Binary search algorithm.
- CO5** - Develop graph and tree traversal algorithms for real time application.
- CO6** - 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 and 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 – JavaThreadModel – 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 – FileInputStream – FileOutputStream. - Reader and Writer Classes – FileReader and FileWriter

UNIT 4 APLET PROGRAMMING AND EVENT HANDLING 9 Hrs.

Applet Class – Applet basics – HTML APLET 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 the 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", Fifth Edition, Tata McGrawHill, 2017.
2. Bruce Eckel , "Thinking in Java", Pearson Education, Fourth 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 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

- Deleted Content

S12BLH31	PROGRAMMING IN JAVA	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To introduce object oriented concepts, packages, interfaces and multithreading in Java.
- To understand input and output operations, GUI programming and database connectivity.
- To impart knowledge on the concepts of server side programs.

UNIT 1 JAVA BASICS 12 Hrs.

Features of Java Language - JVM - Bytecode Data-Types-Java Tokens-Access Modifiers-Operators-Arrays one dimensional and multi-dimensional - Control Structures- String Handling – String class – String buffer class.

Practical: Implementation of Matrix Operations using Arrays, String Operations, Looping Control Statements, Conditional Control Statements.

UNIT 2 OBJECT ORIENTED PROGRAMMING 12 Hrs.

Object Oriented Concepts-Classes and Objects Constructors . Method Overloading-Inheritance Types Using Super Method Overriding Abstract Classes Using final with inheritance- Garbage Collection.

Practical: Implementation of Constructors, Inheritance, Static and dynamic Polymorphism, Abstract Class.

UNIT 3 PACKAGES, INTERFACES AND THREADS 12 Hrs.

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

Practical: Creating custom Packages, Interfaces. Handling predefined and User Defined Exceptions, Implementation Single and Multi-Threading.

UNIT 4 FILE STREAMS AND COLLECTIONS FRAMEWORK 12 Hrs.

IO Package - Introduction – Input Stream and Output Stream classes - Data Output Stream and Data Input Stream classes – FileInputStream – FileOutputStream. - Reader and Writer Classes – File Reader and File Writer-Collections Framework-List, Set, Map.

Practical: Reading Contents from File and Writing Contents to File, Implementation of Collections Frameworks.

UNIT 5 GUI PROGRAMMING, DATA BASE CONNECTIVITY, SERVER SIDE PROGRAMMING 12 Hrs.

GUI Programming using Java FX-Explore Events-Accessing Database using JDBC-Introduction to servlet - Servlet life cycle - Developing and Deploying Servlets – JSP TAGS – Expressions -Applications using Servlet and JSP.

Practical: Creation of Graphical user Interface for different Applications. Creation of Server side Programs using Servlet and JSP.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Develop applications using java object oriented concepts.
- CO2** - Create user defined packages and interfaces.
- CO3** - Build software using the concepts of Files and Collection Framework.
- CO4** - Design GUI using Java FX.
- CO5** - Implement Java applications web using Database connectivity.
- CO6** - Design Web applications using Servlet and JSP.

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. Y. Daniel Liang, "Introduction to Java programming "Comprehensive version, 10th Edition, Pearson Ltd, 2015.
5. <https://docs.oracle.com/javase/tutorial/>.
6. <https://www.tutorialspoint.com/java/>.

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 - Basic concepts - Scheduling criteria - Scheduling algorithms - Preemptive strategies - Non-preemptive strategies.

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 & Variable Partition Multiprogramming - Paging - Segmentation - Paging/Segmentation Systems - Page Replacement Strategies - Demand & 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 - RAID Structure

- Shell Operation Commands - File Management Operation - Internet Service - Telnet - FTP - Filters & Regular Expressions- Case Study (Linux) - Shell Programming - Variable, Arithmetic Operations, Control Structures, Handling Date, Time & 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 EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

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

20 Marks

SCSB1401	OPERATING SYSTEMS AND UNIX	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To have an overview of different types of operating systems and process management.
- To understand the concepts of storage management, I/O and file systems.
- To learn the basics of Unix Programming.

UNIT 1 INTRODUCTION

8 Hrs.

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

UNIT2 PROCESS MANAGEMENT

9 Hrs.

Processes - Process concepts - Process scheduling - Operations on processes - Cooperating processes - CPU scheduling - Basic concepts - Scheduling criteria - Scheduling algorithms - Preemptive strategies - Non-preemptive strategies.

UNIT3 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.

UNIT4 MEMORY MANAGEMENT AND I/O MANAGEMENT

10 Hrs.

Storage Management Strategies - Contiguous vs Non-Contiguous storage allocation - Fixed and variable partition multiprogramming - Paging - Segmentation-Paging / Segmentation systems - Page Replacement strategies - Demand and anticipatory paging, File management: Access methods - Directory structure - Allocation methods - Disk management: Disk structure - Disk scheduling.

UNIT 5 UNIX

9 Hrs.

Unix components - Internal and external commands - File and directory related commands - File permission and manipulation - Standard I/O - Configuring vi environment - Regular expression - Process related commands - Shell programming - Branching control structures- if, case etc. - Loop control structures: while, until, for, etc. - Jumping control structures break, continue, exit, etc. - Integer and real arithmetic in shell programs.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course the 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 in process management.
- CO3** - Analyse synchronization and deadlocks in real computing problems.
- CO4** - Demonstrate the different memory and I/O management techniques used in Operating Systems.
- CO5** - Gain practical exposure in disk scheduling.
- CO6** - Develop shell scripts in vi environment.

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. Andrew S. Tanenbaum, "Modern Operating Systems" 3rd Edition, Addison Wesley, 2004.
5. Eric S. Raymond, "The Art of UNIX Programming", 4th edition 2015.

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

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 V 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 the 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 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 Mark

S11BLH41	DATABASE MANAGEMENT SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To understand the concept of DBMS and ER Modelling.
- To familiarize with normalization, query optimization and relational algebra.
- To apply concurrency control, recovery, security and indexing for the real time data.

UNIT 1 DATABASE SYSTEMS CONCEPTS AND ARCHITECTURE 12 Hrs.

History and motivation for database systems - characteristics of database approach - Actors on the scene - Workers behind the scene - Advantages of using DBMS approach - Data Models, Schema, and Instances - Three-Schema Architecture and Data Independence - The Database System Environment - Centralized and Client/Server Architectures for DBMS - Classification of DBMS.

Practical: Create a database table, add constraints (primary key, unique, check, not null), insert rows, update and delete rows using SQL DDL and DML commands.

UNIT 2 DATA MODELING 12 Hrs.

Entity Relationship Model: Types of Attributes, Relationship, Structural Constraints - Relational Model, Relational model Constraints - Mapping ER model to a relational schema - Integrity Constraints Practical: Create a set of tables, add foreign key constraints and incorporate referential integrity.

UNIT 3 SCHEMA REFINEMENT 12 Hrs.

Guidelines for Relational Schema - Functional dependency - Normalization, Boyce Codd Normal Form, Multi-valued dependency and Fourth Normal form - Join dependency and Fifth Normal form.

Practical: Query the database tables using different 'where' clause conditions and also implement aggregate functions. Query the database tables and explore sub queries and simple join operations.

UNIT 4 QUERY PROCESSING AND TRANSACTION PROCESSING 12 Hrs.

SQL fundamentals -Translating SQL Queries into Relational Algebra - heuristic query optimization - Introduction to Transaction Processing - Transaction and System concepts - Desirable properties of Transactions - Characterizing schedules based on recoverability - Characterizing schedules based on serializability

Practical: Execute complex transactions and realize DCL and TCL commands.

UNIT 5 CONCURRENCY CONTROL, RECOVERY TECHNIQUES AND NOSQL DBMS 12 Hrs.

Two-Phase Locking Techniques for Concurrency Control - Concurrency Control based on timestamp - Recovery Concepts - Recovery based on deferred update - Recovery techniques based on immediate update -Shadow Paging - Introduction, Need of NoSQL - different NoSQL data models: Key-value stores - Column families - Document databases - Graph databases.

Practical: Create Document, column and graph-based data using NOSQL database tools.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Demonstrate the basic concept and role of DBMS in an organization.

CO2 - Illustrate the design principles for database design, ER model.

CO3 - Discuss normalization techniques with simple examples.

CO4 - Demonstrate the basics of query evaluation and heuristic query optimization techniques.

CO5 - Apply Concurrency control and recovery mechanisms for the desirable database problem.

CO6 - Design the database system with the fundamental concepts of DBMS.

TEXT / REFERENCE BOOKS

1. Silberschatz, A., Korth, H. F. and Sudarshan, S., "Database System Concepts", McGraw-Hill, 7th Edition. 2019.
2. Elmasri, R., and Navathe, S. B., "Fundamentals of Database Systems", 4th Edition, Addison Wesley Publishing Edition, 2017.
3. Majumdar, A. K., and Bhattacharyya, P., "Database Management Systems", McGraw-Hill, 2017.
4. Pramod J. Sadalage and Martin Fowler, "NoSQL Distilled: A brief guide to merging world of Polyglot Persistence", Addison Wesley, 2012.
5. Shashank Tiwari, "Professional NoSQL", Wiley, 2011.



- Added Content

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.

LIST OF EXPERIMENTS

1. Study of basic LINUX & 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 the 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

SCSB2401	OPERATING SYSTEMS LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

SUGGESTED LIST OF EXPERIMENTS

1. Working with Shell in Ubuntu/ Fedora.
2. Working with Text Files in Ubuntu
 - a. Editing Files with Vim and Vi
 - b. Starting with Vi
3. Managing Running Processes: Monitoring Process Activity
 - a. Fedora OS Installation on Virtual Machine.
 - b. Post-Installation Configuration on Fedora OS.
 - c. Configuring Basic Tools in Fedora OS.
4. Implementation of Process Scheduling mechanism Priority Scheduling, Round Robin Scheduling, FCFS, SJF.
5. Producer Consumer Problem using Semaphores.
6. Inter-Process Communication using Shared Memory.
7. Bankers Algorithm for Deadlock Avoidance.
8. Memory Allocation Methods for Fixed Partition: First Fit, Worst Fit and Best Fit allocation.
9. Simulate Paging Technique of Memory Management.
10. Page Replacement Algorithms: FIFO, LRU, LFU.
11. File Organization Technique: Single Level Directory, Two Level Directory Organization.
12. Simulate File Allocation Strategies: Sequential, Linked and Indexed.
13. Reader – Writer problem.
14. Diner's Philosopher Problem.
15. Threading and Synchronization Applications.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Infer the basic services and functionalities of the operating system using System Calls in Linux.
- CO2** - Implement CPU Scheduling algorithms such as FCFS, SJF, Priority and Round Robin.
- CO3** - Design programs for deadlock avoidance.
- CO4** - Simulate Memory Management Techniques.
- CO5** - Implement Paging Techniques and Page Replacement Algorithms.
- CO6** - Design solutions for Synchronization problems.

- Added Content

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.

UNIT I FUNDAMENTALS OF NETWORK DESIGN 9 Hrs.

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 II UNDERLYING LAN CONCEPTS 9 Hrs.

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

UNIT III VPNS, INTRANETS AND EXTRANETS 9 Hrs.

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 IV 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 V 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, the 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 EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration :

3 Hrs.

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

20

Marks

SCSB1501	DATA COMMUNICATION AND COMPUTER NETWORKS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To classify different network architectures, transmission methods and switching techniques.
- To evaluate network errors, examine methods to detect and remove them.
- To articulate the functioning behind the data transfer through different transmission mode in a network.

UNIT 1 INTRODUCTION 9 Hrs.
Data communication process - Components of communication media Modes of Communication
IEEE protocol and Standards Network classifications Rudiments of networks topologies Client
Server and Peer to Peer Network Architecture.

UNIT 2 TRANSMISSION MEDIA AND SWITCHING 9 Hrs.
Communication Media-Guided transmission, Unguided and Line of Sight (LOS)-Network connecting
devices - Multiplexing techniques-Switching techniques -Packet switching techniques - Analog and
digital signals Encoding and modulation Parallel and serial transmission.

UNIT 3 ERROR DETECTION, CORRECTION AND COMMUNICATION 9 Hrs.
Types of network errors Error detection Error correction methods Flow control Error control
IEEE 802.3 IEEE 802.5 IEEE 802.11 IEEE 802.15.1 (Piconet and Scatternet).

UNIT 4 ISDN AND ATM 9 Hrs.
Access to ISDN ISDN layers Broadband ISDN Packet layer protocol ATM ATM architecture -
ATM layers Congestion control Leaky bucket algorithm.

UNIT 5 REFERENCE MODELS AND PROTOCOLS 9 Hrs.
OSI Reference models Routing algorithms TCP/IP layered architecture Transport and application
layers of TCP/IP Network Protocols DHCP NAT DNS SMTP HTTP WWW.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Interpret the foundations of communication, network and transmission along with its devices, types, topologies and protocols.
- CO2** - Compare different network architectures, transmission methods and switching techniques.
- CO3** - Classify various types of network errors, examine methods to detect them and evaluate various correction algorithms to remove it.
- CO4** - Apprehend the working of advanced switching network, its protocol and architecture.
- CO5** - Master the functioning behind the data transfer through different transmission mode in a network.
- CO6** - Categorize the layers built in a network and discern the data flow between the layers through diverse range of algorithms.

TEXT / REFERENCE BOOKS

1. Behrouz and Forouzan, "Data Communications and Networking", 6th Edition, 2022.
2. Andrew.S.Tenenbaum, Nick Feamster, David Wetherall, "Computer Networks", 6th Edition, Pearson, 2021
3. WilliamStallings," Data and Computer Communication ", 6th Edition, Pearson Education, 2000.

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** - Added Content

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 – Specialized 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.

UNIT 4 TESTING AND IMPLEMENTATION

9 Hrs.

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.

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 behavioural 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, Second Edition, 2001
5. Rajib Mall, "Fundamentals of Software Engineering", Third 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.

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

S11BLH51	SOFTWARE ENGINEERING DESIGN AND DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To understand the fundamentals of software process and development, requirements engineering and analysis modelling.
- To use UML in requirements elicitation and designing.
- To understand concepts of relationships and aggregations and to test the software against its requirements specification.

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 – Specialized model - 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 and System - Requirement Engineering Process - 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 AN OVERVIEW OF OBJECT ORIENTED SYSTEM DEVELOPMENT 9 Hrs.

Object Oriented System Development Methodology - 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 - Usecase Driven Approach Reusability.

UNIT 4 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 Modeling – Relating Use cases – include, extend and generalization – When to use Use-cases- UML Dynamic Modeling Case study- UML Extensibility - UML Metamodel.

UNIT 5 TESTING AND SOFTWARE QUALITY ASSURANCE 9 Hrs.

Software Testing Fundamentals - White box testing- Basis path testing - Black box testing - Control Structure testing- Regression testing strategies – Levels of testing - Software Quality Assurance- Impact of Object Orientation on Testing -Develop Test Cases and Test Plans - System Usability and User Satisfaction Usability Testing –Software Configuration Management- Re-Engineering - Reverse engineering - Restructuring - Forward engineering.

Practical:

15 Hrs.

1. Create a system to perform book bank operation.
2. Create a system to perform the Exam registration system.
3. Design an object-oriented model for Course reservation system.
4. Design an object-oriented model for Passport automation System.
5. Design an object-oriented model for Book bank management system.
6. Design an object-oriented model for Online course reservation system.
7. Design an object-oriented model for Conference management System.

Max. 60 Hrs.

COURSE OUTCOMES

On Completion of the course, student will be able to

CO1 - Comprehend the basics fundamentals of software process and development.

CO2 - Appreciate the concepts of requirements engineering and analysis modeling.

CO3 - Implement software design with UML diagrams.

CO4 - Interpret the concept of building blocks of modeling.

CO5 - Deploy the various testing methodologies for Software Quality.

CO6 - Design software applications using OO concepts.

TEXT / REFERENCE BOOKS

1. Bruce R. Maxim , Roger S. Pressman , "Software Engineering : A Practitioner's Approach", 8th Edition, 2019.
2. Ian Sommerville, " Software Engineering", 8th Edition, Pearson Education, 2008.
3. Stephan Schach, "Software Engineering", Tata McGraw Hill, 2007
4. Ali Bahrami, "Object oriented systems development using the unified modelling language", McGraw-Hill.
5. Grady Booch, James Rumbaugh, and Ivar Jacobson, "The Unified Modeling Language User Guide", 3rd Edition Addison Wesley.
6. Michael Haug and Eric W Olsen," Software Quality Approaches: Testing, Verification, and Validation: Software Best Practice.
7. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt. Ltd, 2007.

- Added Content

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 behaviour.
- 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 & 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, the 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, Second Edition. Wiley-IEEE Press, 2003/2006.

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

S11BPB51	AUGMENTED AND VIRTUAL REALITY	L	T	P	EL	Credits	Total Marks
		2	0	0	3	3	100

COURSE OBJECTIVES

- To acquire a basic understanding of the tenets of virtual reality, such as immersion and presence.
- To examine the usability and utilization of AR/VR features in AR/VR apps.
- To use the UNITY platform for business, design and prototype effective AR/VR apps.

UNIT 1 INTRODUCTION TO AUGMENTED REALITY AND VIRTUAL REALITY 9 Hrs.

History of Augmented Reality - Displays - Definition and Scope (Multimodal Displays, Spatial Display Model, and Visual Displays) - AR: Strong vs. Weak - AR Applications - AR Challenges. Scope and definition - Types of VR - VR Characteristics - Basic VR Environments - VR Environment Limitations - Virtual Reality Hardware Requirements: Immersion vs. Presence.

UNIT 2 INTERACTION FOR AR/VR ENVIRONMENTS DESIGN 9 Hrs.

Identifying user needs - AR/VR design and analysis - Typical AR/VR graphical metaphors - Affordances in AR/VR - Human Data Processing - Design for perception and cognition - User experience(UX) guidelines for AR/VR - UX obstacles for AR/VR - AR/VR prototypes - AR/VR prototype evaluation.

UNIT 3 INTRODUCTION TO UNITY 9 Hrs.

Overview of Unity: Windows, Interface, Navigation, Terminology, Game Objects, Hierarchy, Parenting Objects - Asset Store, Importing Plug-ins - Terrain Creation, Materials, Colors, and Transparency - Introduction to Mono behaviors: Awake, Start, and Update

UNIT 4 INTRODUCTION TO VUFORIA AND PHYSICS IN UNITY 9 Hrs.

Overview of Vuforia: Interface, Navigation, Terminology, Image Targeting, Custom Images - Introductory to Scripting: Definitions, Creating Objects, Accessing Components, Debugging, Lists, Loops - Overview of Physics in Unity

UNIT 5 EXPANDING ON SCRIPTING AND INTERACTIONS 9 Hrs.

Creating Trigger Events - Manipulating Components in Scripts - Programming Interactions between Objects and Tracked Images - Designing a simple User Interface in AR - Navigating World Space for Objects and User
- Introduction to colliders and their use: OnCollisionEnter, OnCollisionExit, OnCollisionStay, OnTriggerEnter vs OnCollision - Rigidbodies and how Colliders report to them Case Study to building a real time application using AR and VR.

CASE STUDY

- Implement the AR for Tutor and VR for Class Room Project using Unity Software.
- Develop a VR app to virtually view the hardware lab components.
- Illustrate the Remote Desktop to control to your computer in VR.
- Develop a layout of machine shop floor in VR.
- Develop a Virtual Park for experiencing the look of environment with the help of Mixamo Animated Assets with audio.
- Design an environment for playing football and volley ball in VR.
- Develop an AR worm gear for crankshaft image video.
- Develop a layout of Computer Lab in VR environment.
- Develop satellite AR for study purpose, for launch, take off.
- Build a Planetarium set up in VR environment.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Describe the principles and features of VR and AR.

CO2 - Infer the design of AR and VR software.

CO3 - Design the multi model user interface using UNITY.

CO4 - Understand the Vuforia and Scripting Physics.

CO5 - Design user interfaces in AR.

CO6 - Create real time application using AR and VR.

TEXT / REFERENCE BOOKS

1. Sherman, William R. and Alan B. Craig, Understanding Virtual Reality Interface, Application, and Design, Morgan Kaufmann, 2018.
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, 2006.
5. Schmalstieg, D., and Hollerer, T., Augmented Reality: Principles and Practice Addison-Wesley Professional, 2016.



- Added Content

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.

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.

SCSB2501	COMPUTER NETWORKS LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

SUGGESTED LIST OF EXPERIMENTS

1. NETWORK DESIGN AND DEVICES

- To find Network IP address of a machine, time and date server.
- Working with complex network topologies
- To monitor network traffic using Wire Shark

Case Study

- Study of different types of Network cables; implement cross-wired and straight cable using clamp protocol.
- Study of network devices in detail.

2. NETWORKING PROTOCOL AND LAN

- Connect the computers in LAN.
- Construction of VPN Network.
- Construction of Ethernet connection.
- Verify and configure VLAN and VLAN trunk in packet tracer.

Case Study

- To get the MAC or Physical Address of the system Using Address Resolution Protocol.

3. NETWORK SIMULATOR TOOL

- Configure a network topology using packet tracer software.
- To configure simple static routing.
- To implement Security on interconnecting devices.
- To configure network state routing protocol.

Case Study

- Study of Network Simulator (NS) and simulation of congestion control algorithms using NS.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Analyze the performance of network protocols in different layers.

CO2 - Implement Ethernet connection.

CO3 - Design with simulation tools.

CO4 - Analyze various LAN networks.

CO5 - Construct VPN network model.

CO6 - Implement security and configure the network.

- Added Content

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.

UNIT 3 INTERMEDIATE CODE GENERATION 9 Hrs.

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 & 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 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

SCSB1601	COMPILER DESIGN	L	T	P	EL	Credits	Total Marks
		3	1	0	0	3	100

COURSE OBJECTIVES

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

UNIT 1 INTRODUCTION TO COMPILERS AND LEXICAL ANALYSIS 9 Hrs.

Introduction to programming language translators - Structure of a Compiler - Role of Lexical Analyzer - Patterns - Lexemes - Tokens - Attributes - Specification of Tokens - Regular Expression - Regular expression to Deterministic Finite Automata - Minimized DFA - Study on LEX tool.

UNIT 2 SYNTAX ANALYSIS 9 Hrs.

Role of Parser - Context Free Grammar - Derivations and Parse Tree - Elimination of Ambiguity - Top Down Parsing - Predictive Parsing - LL(1) Grammars- Bottom Up Parsing - Shift Reduce Parsers - Operator Precedence Parsing Types of LR Parsers - SLR Parser - Error handling and recovery in syntax analyzer - Study on YACC tool.

UNIT 3 SEMANTICS ANALYSIS AND INTERMEDIATE CODE GENERATION 9 Hrs.

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.

Principal sources of optimization - Loop optimizations - Basic blocks - Optimization of basic blocks - DAG representation of basic blocks -Loops in flow graphs Dominators - Global Data Flow analysis.

UNIT 5 CODE GENERATION 9 Hrs.

Issues in the design of a code generator - Target machine - Next-Use information - Register allocation and assignment- Peephole optimization- Runtime storage management - Activation records - Recent Trends in compiler design.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Demonstrate the functioning of a compiler and to grasp of concepts such as higher level programming, automata theory, and formal languages.
- CO2** - Develop language specifications using context free grammars.
- CO3** - Infer the syntactic and semantic structure in compiler design.
- CO4** - Construct symbol tables and generate intermediate code
- CO5** - Apply code optimization techniques to generate optimized code
- CO6** - Apply the skills on devising, selecting and using tools and techniques towards compiler design

/ REFERENCE BOOKS

1. V. Aho, Monica S. Lam, Ravi Sethi and Jeffrey D. Ullman, "Compilers: Principles, techniques, and tools", Pearson Education, 2015.
2. K. D. Cooper and L. Torczon, "Engineering a Compiler", Morgan Kaufmann, 2nd edition, 2011.
3. V. Raghavan, "Principles of Compiler Design", Tata McGraw Hill Education Publishers, 2010.
4. Steven S. Muchnick, "Advanced Compiler Design and Implementation", Morgan Kaufmann Publishers – Elsevier Science, India, Indian Reprint 2003.

5. Mogensen, Torben Ægidius., "Introduction to Compiler Design"., Springer International Publishing, 2017.

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

- Added Content

SCSA1602	NETWORK SECURITY	L	T	P	Credits	Total Marks
		3	0	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

UNIT 3 PUBLIC KEY ENCRYPTION AND KEY MANAGEMENT 9 Hrs.

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 NETWORKSECURITY 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 the student would 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

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

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration :

3 Hrs.

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

- Deleted Content

SCSB1602	NETWORK SECURITY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To explore the various key distribution and management schemes.
- To learn how to deploy encryption techniques to secure data in transit across data networks.

UNIT 1 BASICS OF CRYPTOGRAPHY 9 Hrs.

The OSI Security Architecture -Services, mechanisms and attacks - A Model for network security – Classical encryption technique- Symmetric cipher model- Substitution technique–Rotor machines – Steganography.

UNIT 2 DATA ENCRYPTION 9 Hrs.

Stream Cipher - SDES - Block cipher principles The Data Encryption Standard The strength of DES – Advanced Encryption Standard - Triple DES.

UNIT 3 KEY DISTRIBUTION AND KEY MANAGEMENT 9 Hrs.

Random key generation- Requirements - Linear Congruential generators- Blum Blum Shub generator Placement of encryption - Traffic confidentiality Key distribution- Public key cryptography and RSA Key Management - Diffie-hellman Key exchange.

UNIT 4 NETWORK PROTECTION, MONITORING, DETECTION, AUTHENTICATION 9 Hrs.

Firewalls, packet filter and stateful firewalls, application aware firewalls, personal firewalls- Intrusion Detection System- Honeypots - 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 Kerberos X.509 Authentication Service.

UNIT 5 ATTACKS AND SYSTEM SECURITY 9 Hrs.

Unauthorized access - Distributed Denial of Service (DDoS) attacks- Man in the middle attacks- Code - SQL injection attacks- Privilege escalation- Insider threats- ARP Cache poisoning- MAC flooding, Side-channel attack- The Secure Sockets Layer (SSL)- Pretty Good Privacy (PGP)- Email Security-Web Security- IP Security Biometric Security.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Explain the facts and fundamental ideas of symmetric encryption schemes.
- CO2 - Illustrate various encryption standards and its challenges in the network.
- CO3 - Experiment with key encryption mechanisms and key management strategies in new situations.
- CO4 - Design suitable network protection, monitoring and detection strategies that detect or prevent from the threat.
- CO5 - Defend the network from external or internal authentication threats.
- CO6 - Design security strategies and resolve security issues in networks and computer systems to secure an organization / IT infrastructure.

TEXT / REFERENCE BOOKS

1. William Stallings, Cryptography and Network Security: Principles and Practice, 8th Edition, Pearson edition, 2020.
2. Behrouz A. Forouzan, Cryptography and Network Security, McGraw-Hill, 3rd Edition 2015.
3. W. Stallings, Network Security Essentials: Applications and Standards, 6th Edition, Pearson Prentice Hall, 2016.
4. Bryan Sullivan and Vincent Liu, Web Application Security, A Beginner's Guide, McGraw-Hill Education, 2012.
5. C. Kaufman, R. Perlman and M. Speciner, Network Security: Private Communication in a Public World, 2nd Edition, Prentice Hall PTR, 2002.

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** - Added Content

SCSB1603	PARALLEL AND DISTRIBUTED COMPUTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand parallel programming model, analyse synchronization and deadlocks in real computing problems
- To design distributed shared memory in the modern operating system.
- To understand group communication in distributed computing.

UNIT 1 INTRODUCTION TO PARALLEL COMPUTING

9 Hrs.

Motivating Parallelism- Scope of Parallel Computing- Modifications to the von Neumann Model- Parallel Hardware: SIMD systems- MIMD systems-Interconnection networks- Cache coherence- Shared memory versus distributed memory. Parallel Software: Caveats- Coordinating the processes/threads Programming hybrid systems.

UNIT 2 ARCHITECTURES AND PROGRAMMING

9 Hrs.

Parallel architectures-Trends in architectures CMPs-GPUs and Grids Multiprocessors Multicomputers- Multithreading-Pipelining-VLIWs-Superscaling-Vectors-SIMDs-paradigm of shared-memory- distributed memory interconnection networks-optical computing, Models of parallelism: PRAM - CTA. Performance and Floating Point Considerations-Parallel Programming and Computational Thinking- Introduction to OPENCL.

UNIT 3 COMMUNICATION IN DISTRIBUTED COMPUTING

9 Hrs.

Introduction - Goals of Distributed computing Design issues Transparency Flexibility- Reliability- Performance Scalability - Client Server Model Remote procedure call Group Communication.

UNIT 4 SYNCHRONIZATION AND PROCESS IN DISTRIBUTED SYSTEMS

9 Hrs.

Synchronization: Algorithms-Deadlocks-Threads-System Models-Workstation-model-Processor Pool Model-Hybrid Model-Scheduling in Distributed systems.

UNIT 5 DISTRIBUTED FILE SYSTEMS AND SHARED MEMORY

9 Hrs.

Distributed File System Design-Distributed File System Implementation -storage systems-performance studies, Introduction to Shared Memory-Consistency Models-Shared Variable Distributed Shared Memory - Case Study MACH.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, the student will be able to

- CO1 - Recognize various parallel computing and parallel system's architecture.
- CO2 - Describe the parallel programming model.
- CO3 - Interpret group communication and distribution of the control towards the operating system.
- CO4 - Apply the concepts of synchronization and deadlocks in real computing problems.
- CO5 - Construct the distributed shared memory in the modern operating system.
- CO6 - Implement a MACH.

TEXT / REFERENCE BOOKS

1. Ananth Grama and George Karypis, "Introduction to Parallel computing", Addison-wesley, 2009.
2. Peter S. Pacheco, "An Introduction to Parallel Programming", 2nd Edition, Morgan Kaufmann, 2021.

3. Ananth Grama and George Karypis, to Parallel C -Wesley2009.

"Introduction

4. David Culler and Jaswinder Pal Singh, "Parallel Computer Morgan Kaufmann, 1999.
5. Andrew S. Tanenbaum and Maarten van Steen, "Distributed Systems: Principles and Paradigms", Prentice Hall, 2017.
6. Pradeep K Sinha, "Distributed Operating Systems, Concepts and Design", Prentice Hall of India, 2009.

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

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 & 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 the 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 EXAM QUESTION PAPER PATTERN

Max. Marks : 100

3 Hrs.

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

Marks

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

Marks

Exam Duration :

20

80

S11BLH 61	MACHINE LEARNING	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To emphasize on the logical, knowledge-based approach.
- To acquire knowledge in hyper parameter tuning which can be applied for projects and solving practical problems.
- To gain experience of doing independent study and research.

UNIT 1 INTRODUCTION TO MACHINE LEARNING 12 Hrs.

Machine Learning—Applications - Types of Machine Learning – Training, Testing, - Machine Learning process Variance Bias - Training Error Testing Error - Overfitting Underfitting Gradient Descent – Accuracy –Precision –Recall –Confusion Matrix

Practical: Split the given dataset into 80 percentage training data and 20 percentage test data. Illustrate confusion matrix using IRIS dataset.

UNIT 2 DATA PRE PROCESSING 12 Hrs.

Why data preprocessing - Steps of preprocessing - Data cleaning – Missing values, Noisy data, Removing outliers - Data integration – Data transformation – Generalization - Normalization - Min-max normalization, Z-Score normalization, Decimal scaling normalization, Decimal scaling normalization, Attribute selection, Label encoding – One Hot encoding- Data reduction - Dimensionality reduction – PCA.

Practical: Apply a scaling technique for a given data set after dealing with missing values. Take a valid dataset, reduce dimensions using PCA.

UNIT 3 SUPERVISED LEARNING 12 Hrs.

Regression - Linear Models for Regression – Classification – Logistic Regression - Classification Models - KNN Classification – Naïve Bayes Classification – Decision Tree Classification – Support Vector Machine – Ensemble Learning – Random Forest

Practical: Predict heart disease by exploiting KNN Classification Algorithm. Apply SVM and Decision Tree for classification and check their accuracy level.

UNIT 4 UNSUPERVISED LEARNING 12 Hrs.

Clustering - k-means clustering - Supervised Learning after clustering - Hierarchical clustering—Iterative distance-based clustering - Dealing with continuous, categorical values in K-Means - Constructing a hierarchical cluster - K-Medoids - k-Mode and density-based clustering - Measures of quality of clustering Practical: Cluster the given dataset using K means.

Once clusters are formed, apply appropriate supervised learning algorithm.

UNIT 5 NEURAL NETWORK AND LOCAL MODELS 12 Hrs.

Structure of a brain - Artificial Neural Network Perceptron Activation function Sigmoid Relu Tanh – Multilayer perceptron – Feed forward propagation – Back propagation - Training process in neural network Loss function - Gradient descent - Tuning the network size - Learning rate - Competitive learning - Adaptive resonance theory - Self organizing map -Radial basis functions Bagging - Boosting - Reinforcement Learning Hyper Parameter tuning.

Practical: Predict the appropriate class by using ANN. Perform various hyper parameter tuning and check the accuracy.

Max.60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Comprehend the underlying terminologies and applications of Machine Learning.

CO2 - Apply relevant preprocessing techniques and make the Data ready for applying machine learning algorithms.

CO3 - Deploy various supervised learning techniques.

CO4 - Implement various unsupervised learning algorithms.

CO5 - Develop neural network models.

CO6 - Implement machine learning algorithms for a wide variety real time applications.

TEXT / REFERENCE BOOKS

1. Burkov, Andriy, "The Hundred-page Machine Learning Book ," 2019.
2. Theobald, Oliver. , " Machine Learning for Absolute Beginners: A Plain English Introduction" , Scatterplot Press, 2017.
3. Michalski, Ryszard S., et al., "Machine Learning: An Artificial Intelligence Approach (Volume I) " Elsevier Science, 2014.
4. Maini, Vishal, and Sabri, Samer. Machine Learning For Humans: Introduction to Machine Learning with Python. Romania, Alanna Maldonado, 2023.
5. Bishop, christopher M., "Pattern Recognition and Machine Learning ."Springer New York, 2006.

- Added Content

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.

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 the student will be able to

- CO1:** Apply the LEX tool & YACC tool to develop a scanner & 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

SCSB2601	COMPILER DESIGN LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

SUGGESTED LIST OF EXPERIMENTS

1. AUTOMATA THEORY

- Construction of NFA and DFA from a regular expression.
- Construct the conversion of NFA to DFA

Case Study

- Possibilities of getting 6 in two dices. Construct the finite automata for solving dice game.

2. LEX and YACC

- Use LEX tool to implement Lexical Analyzer.
- Use LEX to count the number of tokens in an expression
- Use LEX to check whether string is accepted or not for entered grammar
- Use LEX and YACC to implement Parser using Ambiguous Grammar.
- Use LEX and YACC to implement Parser using Unambiguous Grammar.

Case Study

- Step by step math problem solver is used to get the solution for solving many math problems such as algebra, calculus, linear systems, quadratic equations, etc. But for that basic arithmetic operations are very important. Using LEX and YACC tool implement the basic arithmetic operations.

3. PARSER

- Implement Recursive Descent Parser algorithm.
- Implement Shift Reduce Parser algorithm.
- Implement Operator Precedence Parser algorithm

Case Study

- Real-world constructions like sentences or mathematical expressions become very easy when it comes to graphical representation use the parser to implement the tree structure for a grammar.

4. CODE GENERATOR AND OPTIMIZER

- Implement the compiler to produce three address codes.
- Implement Symbol Table Management.
- Implementation of simple code optimization techniques

Case Study

- Construct a Simple compiler.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1 - Analyse tokens for the given source code using Lex tool.
- CO2 - Develop a parser using Lex and Yacc tool.
- CO3 - Construct Finite automata for any given regular expression.
- CO4 - Develop the parser for checking syntactic error.
- CO5 - Generate symbol table and target code for the given input.
- CO6 - Design a compiler to convert given source code to target code

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 the 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 ", 3rdEdition, 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.,

First Edition, 2008.

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

- Deleted Content

SCSB1701	ARTIFICIAL INTELLIGENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn the different problem solving and search strategies in AI and analyze the optimization techniques.
- To understand the knowledge representation and logic in solving AI problems, planning and reasoning.
- To know about the various learning algorithms and applications of AI.

UNIT 1 AI's FOUNDATION AND INTELLIGENT AGENTS 9 Hrs.

Introduction: What is AI - Foundations of AI - History of AI - Intelligent agent - Rationality - Performance measures - Nature of environments - Structure and types of agents - Problem solving agents : Toy problems - Real world Problems - Case study : Vacuum cleaner world.

UNIT 2 SEARCH METHODS AND OPTIMIZATION TECHNIQUES 9 Hrs.

Uninformed search : Breadth first search - Depth first search - Depth limited search - Iterative deepening DFS - Bidirectional search - Informed search - Greedy Best First Search - A* search - Heuristic functions - Optimization - Hill climbing - Simulated annealing - Local beam search - Genetic algorithm - Case study : 8 puzzle problem.

UNIT 3 BACKTRACKING AND KNOWLEDGE REPRESENTATION 9 Hrs.

Backtracking - Constraint satisfaction problems - Gaming - Adversarial search - Optimal decisions in games - Alpha Beta pruning - Case study : 8 queens problem.
Knowledge based agents - Propositional logic - First order logic - Forward and backward chaining - Ontological engineering - Case study: Wumpus world problem.

UNIT 4 PLANNING AND REASONING 9 Hrs.

Planning - Classical planning - State space search - Progression and Regression - Partial order planning - Planning and acting in real world - Reasoning - Acting under uncertainty - Bayes' rule - Probabilistic reasoning - Semantics and inference in Bayesian networks - Decision networks, Case study : Air cargo transport problem.

UNIT 5 LEARNING AND AI APPLICATIONS 9 Hrs.

Learning - Supervised learning - Explanation based learning - Probabilistic learning - Reinforcement learning - Applications - NLP - Speech Recognition - Object Recognition - Robotics - Case study : Word2Vec Problem.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Identify how an intelligent agent works to take actions.

CO2 - Analyze the search algorithm for solving AI problems.

CO3 - Upgrade a problem solution with optimization techniques.

CO4 - Apply knowledge based agent to solve the problems logically.

CO5 - Apply the Bayes' rule to solve the problem with uncertainty conditions.

CO6 - Design AI algorithms to work with real time applications.

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 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

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

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 the student would 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

2. Joshua N. Milligan, "Learning Tableau", Packt Publishing, 2015.
3. Chuck Lam, "Hadoop in Action", Manning Publications Co., 2018.
4. Tom White, "Hadoop the Definitive Guide", O'Reilly, 4th Edition, 2015.
5. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilly, 2010.
6. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, Edition I, ISBN-10: 1107015359 | ISBN-13: 978-1107015357, 2011.
7. Jimmy Lin and Chris Dyer, "Data-Intensive Text Processing with MapReduce", Morgan & Claypool Publishers, 2010.
8. 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 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

 - Deleted Content

S12BLH71	BIG DATA ANALYTICS	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To understand the architecture of Hadoop, including the Hadoop Distributed File System (HDFS) and the Hadoop ecosystem and apply the knowledge to work with Hadoop and Spark for data processing.
- To analyze and compare NoSQL databases like MongoDB, HBase, and Cassandra based on their architectures and data models.
- To design and build data visualizations and interactive dashboards using PowerBi and Tableau.

UNIT 1 INTRODUCTION

12 Hrs.

Introduction to Big Data–Evolution- Challenges in the traditional systems - characteristics of Big Data – Five V's of Big Data – Hadoop architecture–Hadoop Distributed File System Hadoop Ecosystem.

Practical: Installing and configuring Hadoop on a local or distributed environment - working with HDFS commands - Performing basic operations like file creation, deletion, and listing using Hadoop Distributed File System (HDFS).

UNIT 2 DATA STORAGE AND PROCESSING

12 Hrs.

Map Reduce Framework - HDFS write and Read - YARN architecture - Spark architecture, Streaming - Apache Mahout.

Practical: Loading data from various sources into Hadoop, such as CSV files, JSON data, or database tables. Algorithms using map reduce - word count, matrix multiplication Implementing the ML algorithms using Apache Spark: Linear Regression, K-means Clustering, Random Forest Classifier - Developing a Recommendation System with Apache Mahout.

UNIT 3 BIG DATA ECOSYSTEM TOOLS

12 Hrs.

Data Ingestion and Streaming:Kafka, Flume - Data Querying and Analysis:Drill, Impala - Data Processing: Hive, Pig -Data Integration and Workflow Management: Nifi, Oozie.

Practical: Write Pig Latin scripts to process data stored in Hadoop.- Implementing streaming data processing using frameworks like Apache Kafka or Apache Flink.

UNIT 4 NOSQL DATABASES AND DATA EXPLORATION

12 Hrs.

Introduction to NoSQL - MongoDB: Document-oriented data model, CRUD operations, Querying and indexing, Aggregation Hbase - Cassandra: Architecture, Data Model, Data Design– Effective Data Visualization: Power BI Introduction to Tableau.

Practical : Connecting MongoDB with Power BI: Importing data from MongoDB into Power BI for visualization - Creating Basic Visualizations in Power BI: Building charts, graphs, and tables in Power BI - Customizing visualization properties and formatting options .

UNIT 5 DATA VISUALIZATION AND BUSINESS INTELLIGENCE 12 Hrs.

Tableau - Apache Superset-Business use cases: Sentiment Analysis for Social Media Posts, identify fraudulent activities in financial transactions, machine learning model to predict customer behaviour, Demand Forecasting -Recommender Systems.

Practical: Connect Tableau to a dataset (e.g., CSV file, Excel spreadsheet, and database). - creating interactive dashboards and reports. basic visualizations such as bar charts, line charts, and scatter plots, Customize visualizations by adjusting colors, labels, and formatting options, Add filters - Creating Dashboards: Design and build a dashboard with multiple visualizations - Advanced Analytics and Forecasting: Apply Tableau's built-in analytics functions for data analysis, perform trend analysis, forecasting, and statistical calculations - Embed Tableau visualizations in web pages

Apache Superset: Open-source data exploration and visualization platform for creating charts, dashboards, and data exploration

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Understand the fundamental concepts and characteristics of Big Data, including its challenges and the need for specialized technologies and frameworks.
- CO2** - Gain proficiency in installing, configuring, and working with Hadoop, including Hadoop Distributed File System (HDFS), MapReduce, and YARN.
- CO3** - Acquire practical skills in loading and processing data using Hadoop, including working with various data formats and applying algorithms for different applications in real time.
- CO4** - Utilize key tools in the Big Data ecosystem, such as Kafka, Flume, Drill, Impala, Hive, Pig, Nifi, and Oozie, for data ingestion, querying, analysis, processing, and workflow management.
- CO5** - Develop a strong understanding of NoSQL databases like MongoDB, HBase, and Cassandra, including data modeling, CRUD operations, querying, and aggregation.
- CO6** - Learn data visualization and business intelligence techniques using tools like Tableau and Apache Superset, enabling the creation of interactive dashboards, basic visualizations, advanced analytics, and forecasting.

TEXT / REFERENCE BOOKS

1. Mayer-Schönberger, Viktor, and Kenneth Cukier. "Big Data: A Revolution That Will Transform How We Live, Work, and Think." Houghton Mifflin Harcourt, 2013.
2. White, Tom. "Hadoop: The Definitive Guide." O'Reilly Media, 2015.
3. Holmes, Alex. "Hadoop in Practice." Manning Publications, 2014.
4. Chambers, Bill, and Matei Zaharia. "Spark: The Definitive Guide." O'Reilly Media, 2018.
5. Akidau, Tyler, Slava Chernyak, and Reuven Lax. "Streaming Systems: The What, Where, When, and How of Large-Scale Data Processing." O'Reilly Media, 2018.
6. Chodorow, Kristina. "MongoDB: The Definitive Guide." O'Reilly Media, 2013.
7. George, Lars. "HBase: The Definitive Guide." O'Reilly Media, 2011.
8. Carpenter, Jeff, and Eben Hewitt. "Cassandra: The Definitive Guide." O'Reilly Media, 2010.
9. Sleeper, Ryan. "Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master." O'Reilly Media, 2018.
10. Murray, Daniel G. "Tableau Your Data! Fast and Easy Visual Analysis with Tableau Software." Wiley, 2016.
11. Grandi, Andrea. "Learning Apache Superset: Interactive Data Visualization and Business Intelligence." Packt Publishing, 2020.

SCSB3001	INFORMATION SECURITY ANALYSIS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To explore system security related incidents and counter measures against common threat / vulnerabilities.
- To install, configure and troubleshoot information security devices and gain experience using tools and common processes in information security analysis of compromised systems.
- To gain insight on potential defences and measures the common threat/vulnerabilities

UNIT 1 INFORMATION SECURITY FUNDAMENTALS 9 Hrs.

Definitions and challenges of security - Attacks and services - Security policies - Security controls - Access control structures - Cryptography - Deception - Ethical hacking - Firewalls - Identify and Access Management (IdAM).

UNIT 2 SYSTEM SECURITY 9 Hrs.

System vulnerabilities - Network security systems - System security - System security tools - Web security - Application security - Intrusion detection systems.

UNIT 3 INFORMATION SECURITY MANAGEMENT 9 Hrs.

Monitor systems and apply controls - Security assessment using automated tools - Backups of security devices - Performance analysis - Root cause analysis and Resolution - Information security policies - Procedures - Standards and guidelines.

UNIT 4 INCIDENT MANAGEMENT 9 Hrs.

Security requirements- Risk management - Risk assessment - Security incident management-Third party security management -Incident components - Roles.

UNIT 5 INCIDENT RESPONSE 9 Hrs.

Incident response lifecycle - Record, classify and prioritize information security incidents using standard templates and tools -Responses to information security incidents - Vulnerability assessment - Incident analysis.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Understand the basics of information security.
- CO2** - Identify and analyse the responses to information security incidents.
- CO3** - Install and configure information security devices.
- CO4** - Perform various analysis of security management.
- CO5** - Acquire the knowledge about the risk and incident management in information security analysis.
- CO6** - Develop a healthy, safe and secure working environment.

TEXT / REFERENCE BOOKS

1. William Stallings, Lawrie Brown, "Computer Security: Principles and Practice", 3rd edition, 2014.
2. Nina Godbole, "Information Systems Security: Security Management, Metrics, Frameworks and Best Practices", Wiley, 2017.
3. Nina Godbole, Sunit Belapure, "Cyber Security- Understanding cyber-crimes, Computer Forensics and Legal Perspectives", Wiley Publications, 2016
4. Andrew Vladimirov Michajlowski, Konstantin, Gavrilenko, "Assessing Information Security: Strategies, Tactics, Logic and Framework, IT Governance Ltd", O'Reilly, 2010.
5. Lee Allen, Kevin Cardwell, "Advanced Penetration Testing for Highly-Secured Environments", Second Edition, PACKT Publishers, 2016.

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**

SCSB3002	CYBER CRIMES AND LAW	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To gain knowledge on the basic concepts of cybercrimes, forensics and investigation process.
- To gain insight about the Information Technology act.
- To explore various electronic records and digital signature, legal protection against cybercrimes.

UNIT 1 INTRODUCTION TO CYBERCRIME

9 Hrs.

Introduction — Understanding the how's and why's of cybercrime - Understanding cybercrime in digital environment- Threats: Intellectual Property - Software attacks – Deviations in QoS – Espionage – Forces of nature – Human error – Information extortion – Sabotage – Theft – Hardware failures – Software failures attacks: Malicious code+Hoaxes Crack Brute Force Dictionary DoS and DDoS Spoofing-Man-in-the-Middle Spam Email bombing Sniffers Social engineering Pharming Timing attack. –

UNIT 2 COMPUTER FORENSICS AND INVESTIGATION PROCEDURES

9 Hrs.

Introduction to computer forensics - Use of computer forensics in law enforcement - Computer forensics services- Benefits of professional forensics methodology - Steps taken by computer forensics Specialists- Who Can Use computer forensic evidence? - Cyber detectives - Computer forensics investigative service
- Forensics process improvement.

UNIT 3 DEFINITIONS AND TERMINOLOGY (IT ACT, 2000)

9 Hrs.

Internet - Internet Governance - E-contract - IT Act provisions for E-contracts in India - Features of E-contracts - Types of E-contracts - Use of Digital Signatures for E-contracts- Encryption - Data Security: Pillars of Security - Security threats - Causes of security threats - Technology solutions to Security Threats
- Security Policy - Cybersecurity and legal framework.

UNIT 4 ELECTRONIC RECORDS

9 Hrs.

Authentication of electronic records - Legal recognition of electronic records - Legal recognition of Digital Signatures - Use of electronic records and digital signatures in government and its agencies - Retention of electronic records - Publication of rules and regulations in electronic gazette, Attribution, acknowledgement and dispatch of electronic records - Secure electronic records and digital signatures.

UNIT 5 LEGAL PROTECTION AGAINST CYBER CRIMES

9 Hrs.

Criminal liabilities under Information Technology Act 2000 - Common Cyber Crimes and Applicable Legal Provisions: A Snapshot - Civil liabilities under Information Technology Act 2000 - Civil liability for corporate: Cyber Crimes under IPC and special laws - The Indian Penal Code, 1860 - Cyber crimes under the special acts.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand the basic concepts of cybercrimes and its types.
- CO2 - Enhance the knowledge about the forensics and investigation process.
- CO3 - Interpret the Information Technology Act.
- CO4 - Explore various electronic records and digital signature.
- CO5 - Understand the special laws and the Indian penal code.
- CO6 - Learn about the legal protection against cyber crimes.

TEXT / REFERENCE BOOKS

1. Michael E. Whitman, Herbert J. Mattord, "Principles of Information Security", Cengage Learning, 4th Edition.
2. Graham, "Cybercrime and Digital Deviance", 1st Edition, Taylor and Francis.
3. John R. Vacca, "Computer Forensics: Computer crime Scene Investigation", Charles RiverMedia, 2nd Edition, 2005.
4. Dr. U.S. Pandey, "Cybercrime and Laws", Himalaya Publishing House. 1st edition 2017.

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

SCSB3003	LINUX PROGRAMMING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To teach principles of operating system including file handling utilities, security by file permissions, Process utilities, Disk utilities, Networking Commands, Basic Linux commands, Scripts and filters.
- To familiarize fundamentals of the Bourne again shell (bash), shell programming, pipes, input and output redirection Control structures, arithmetic in shell interrupt processing, functions, debugging shell scripts.
- To impart fundamentals of file concepts kernel support for file, File structure related system calls (file API's), Inter process communication, semaphore and shared memory.

UNIT 1 INTRODUCTION TO LINUX AND LINUX UTILITIES 9 Hrs.

Linux commands - PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip - File handling utilities - Security by file permissions - Process utilities - Disk utilities - Networking commands - unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin. Text Processing utilities and backup utilities - tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio.

UNIT 2 INTRODUCTION TO SHELLS AND FILTERS 9 Hrs.

Linux Session - Standard Streams - Redirection Pipes - Tee Command - Command Execution - Command line editing - Quotes - Command Substitution - Job Control Aliases - Variables - Predefined Variables - Options - Shell/Environment Customization.

Filters and Pipes - Concatenating files - Display beginning and end of files - Cut and paste - Sorting - Translating Characters - Files with Duplicate Lines - Count Characters, Words or Lines - Comparing Files.

UNIT 3 GREP, SED, UNIX FILE STRUCTURE AND FILE MANAGEMENT 9 Hrs.

Operation - grep Family - Searching for File Content - Scripts, Operation, Addresses, commands, Applications - grep and sed - Introduction to UNIX file system - inode (Index Node) - File descriptors, system calls and device drivers - File Structures - System Calls for File Management - create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown - Directory API - opendir, readdir, closedir, mkdir, rmdir, umask.

UNIT 4 PROCESS AND SIGNALS 9 Hrs.

Process - Process identifiers - Process structure - Process table - Viewing processes - System processes - Process scheduling - Starting new processes - Waiting for a process - Zombie processes - Orphan process - fork, vfork, exit, wait, waitpid, exec - Signals functions - Unreliable signals - Interrupted system calls - kill, raise, alarm, pause, abort, system, sleep functions, signal sets. File locking: creating lock files - Locking regions - Use of read and write with locking - Competing locks - Other lock commands - Deadlocks.

UNIT 5 INTER PROCESS COMMUNICATION AND SOCKETS 9 Hrs.

Pipe - Process pipes - The pipe call - Parent and child processes and named pipes: fifos - Semaphores: semget, semop, semctl - Message queues: msgget, msgsnd, msgrcv, msgctl - Shared memory: shmget, shmat, shmdt, shmctl - ipc status commands - Socket - Socket connections - Socket attributes - Socket addresses - socket, connect, bind, listen, accept, socket communications.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Apply various Linux commands that are used to manipulate system operations at admin level and a prerequisite to pursue job as a Network administrator.
- CO2** - Develop Shell programs using Linux commands.
- CO3** - Design applications to manipulate internal kernel level Linux File System.
- CO4** - Develop IPC- API's for controlling various processes for synchronization.
- CO5** - Develop network programs that allows applications to make efficient use of resources available on different machines in a network.
- CO6** - Develop socket programs for networking applications.

TEXT / REFERENCE BOOKS

1. W. Richard. Stevens, Advanced Programming in the UNIX Environment , 3rd edition, Pearson Education, New Delhi, India, 2013.
2. Behrouz A. Forouzan, Richard F. Gilberg. Thomson, "Unix and Shell Programming ", 2003.
3. Robert Love, "Linux System Programming ", O'Reilly, 2013.
4. W.R.Stevens. " Advanced Programming in the UNIX Environment , 2nd Edition, Pearson Education, 2013.
5. W.R. Stevens, "UNIX Network Programming", PHI, 2004.

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

SCSB3004	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the fundamentals of Cryptography, standard algorithms used to provide confidentiality, integrity and authenticity.
- To explore the various key distribution and management schemes, 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.

Security trends - Legal, ethical and professional aspects of security - Need for security at multiple levels - Security policies - Model of network security - Security attacks, services and mechanisms - OSI security architecture - Classical encryption techniques: Substitution techniques - Transposition techniques, steganography - Foundations of modern cryptography - Perfect security - Information theory - Product cryptosystem - Cryptanalysis.

UNIT 2 SYMMETRIC CRYPTOGRAPHY

9 Hrs.

Mathematics of Symmetric key cryptography: Algebraic structures - Modular arithmetic - Euclid's algorithm - Congruence and matrices - Groups, Rings, Fields - Finite fields - Symmetric Key Ciphers: SDES - Block cipher - Principles of DES - Strength of DES - Differential and linear cryptanalysis - Block cipher design principles - Block cipher mode of operation - Evaluation criteria for AES - Advanced Encryption Standard - RC4 - Key distribution.

UNIT 3 PUBLIC KEY CRYPTOGRAPHY

9 Hrs.

Mathematics of Asymmetric Key Cryptography: Primes - Primality testing - Factorization - Euler's totient function - Fermat's and Euler's theorem - Chinese Remainder theorem - Exponentiation and logarithm - Asymmetric Key Ciphers: RSA cryptosystem - Key distribution - Key management - Diffie Hellman key exchange - ElGamal cryptosystem - Elliptic curve arithmetic - Elliptic curve cryptography.

UNIT 4 MESSAGE AUTHENTICATION AND INTEGRITY

9 Hrs.

Authentication requirement - Authentication function - MAC - Hash function - Security of hash function and MAC - SHA - Digital signature and authentication protocols - DSS - Entity Authentication: Biometrics, Passwords - Challenge Response protocols - Authentication applications - Kerberos - X.509

UNIT 5 SECURITY PRACTICE AND SYSTEM SECURITY

9 Hrs.

Electronic Mail security - PGP - S/MIME - IP security - Web Security - System Security: Intruders - Malicious software - Viruses - Firewalls.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Detect and resolve network's security issues.
- CO2 - Assess the vulnerabilities in a computer network.
- CO3 - Apply suitable encryption algorithm to ensure security.
- CO4 - Apply the various authentication schemes to simulate different applications.
- CO5 - Design network application security schemes such as PGP, S/MIME.
- CO6 - Understand various security practices and system security standards.

TEXT / REFERENCE BOOKS

1. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson, 2016.
2. C K Shyamala, N Harini and Dr. T R Padmanabhan, "Cryptography and Network Security", Wiley India Pvt.Ltd., 2015.
3. Behrouz A. Forouzan, "Cryptography and Network Security", Tata McGraw Hill 2008.
4. Charlie Kaufman, Radia Perlman, and Mike Speciner, "Network Security: Private Communication in a Public World", Addison Wesley, 2022.

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**

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 modelling 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 & 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 & 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 - WirelessHart, 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 & 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

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 the 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.

TEXT / REFERENCE BOOKS

2. "Industry 4.0: The Industrial Internet of Things", Alasdair Gilchrist (Apress)
3. "Industrial Internet of Things: Cyber manufacturingS ystems" Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer)
4. 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.
5. Rajeev Alur. Principles of Cyber-Physical Systems. MIT Press. 2015.
6. K. J. Astrom and R. M. Murray. Feedback Systems: An Introduction for Scientists and Engineers. Prince- ton University Press, 2009.
http://www.cds.caltech.edu/~murray/amwiki/index.php/Main_Page.
7. Sajal Das, Krishna Kant, and Nan Zhang, Securing Cyber-Physical Critical Infrastructure – Foundations & Challenges, Morgan Kaufmann, 2012.

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

SCSB3005	CYBER PHYSICAL SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To study the basic concepts, requirements, principles, and techniques in emerging cyber physical systems.
- To provide students hands-on experience in prototyping a cyber-physical system and address real-world problems through Cyber Physical Systems
- To develop an exposition of the challenges in implementing a cyber-physical system from a computational perspective

UNIT 1 COMPUTATIONAL FOUNDATION, DESIGN AND SYSTEM REQUIREMENTS

9 Hrs.

Cyber Physical Systems in real world - Basic principle of Cyber Physical Systems - Industry 4.0 - IIoT - Cyber Physical Systems design recommendations - CPS system requirement - Cyber Physical System application - Case study of Cyber Physical Systems.

UNIT 2 PLATFORMS, MODELS AND DYNAMICS BEHAVIOURS

9 Hrs.

Hardware platforms for Cyber Physical Systems (Sensors/Actuators, Microprocessor/Microcontrollers) - Wireless technologies for Cyber Physical Systems - Continuous Dynamics - Discrete dynamics - Hybrid systems.

UNIT 3 CONCURRENT MODELS OF COMPUTATION

9 Hrs.

Structure of model - Synchronous reactive models - Dataflow models of computation - Timed models of computation.

UNIT 4 STUDY OF EMBEDDED SYSTEMS VS INTERNET OF THINGS VS CYBER PHYSICAL SYSTEM

9 Hrs.

Design of Embedded Systems (I/O Units, Multitasking and Scheduling) - Internet of Things Architecture - CPS architecture.

UNIT 5 SECURITY AND PRIVACY IN CYBER PHYSICAL SYSTEMS

9 Hrs.

Security and Privacy issues in CPSs - Local network security for CPSs Internet - Wide Secure Communication - Security and privacy for cloud - Interconnected CPSs - Case Study: Cyber security in Digital Manufacturing / Industry 4.0.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1 - Comprehend the need and purpose of the different components of cyber physical systems.
- CO2 - Develop the ability to interact with cyber physical systems.
- CO3 - Design a new system with which a product can be made.
- CO4 - Comprehend the semantics of a CPS model.
- CO5 - Develop the ability to interact with cyber physical systems protocols.
- CO6 - Analyse common methods used to secure cyber physical systems.

TEXT / REFERENCE BOOKS

1. Rajeev Alur, "Principles of Cyber Physical Systems," MIT Press, 2015.

2. E. A. Lee, SanjitSeshia , "Introduction to Embedded Systems – A Cyber Physical Systems Approach", Second Edition, MIT Press, 2017, ISBN: 978-0-262-53381-2.
3. Guido Dartmann, Houbing song, Ankeschmeink, "Big data analytics for Cyber Physical System", Elsevier, 2019.
4. Houbing song, Danda B Rawat, Sabina Jeschke, Christian Brecher, "Cyber Physical Systems Foundations, Principles and Applications", Elsevier, 2017.
5. Chong Li, MeikangQiu, "Reinforcement Learning for Cyber Physical Systems with Cyber Securities Case Studies", CRC press, 2019.
6. Houbing Song, Glenn A.Fink, Sabina Jesche, "Security and Privacy in Cyber-Systems: Foundations, Principles utions", IEEE Press.

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

SCSB3007	ETHICAL HACKING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the basics of computer-based vulnerabilities, different foot printing, reconnaissance and scanning methods.
- To explore the enumeration and vulnerability analysis methods, hacking options available in web and wireless applications.
- To explore the options for network protection, tools to perform ethical hacking to expose the vulnerabilities.

UNIT 1 INTRODUCTION

9 Hrs.

Ethical Hacking overview - Role of security and penetration testers- Penetration - Testing Methodologies - Laws of the Land - Overview of TCP/IP - Application layer - Transport layer - Internet layer - IP Addressing. - Network and computer attacks - Malware - Protecting against malware attacks - Intruder attacks - Addressing physical security.

UNIT 2 FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS

9 Hrs.

Footprinting concepts - Footprinting through search engines, web services, social networking sites, website, Email - Competitive intelligence - Footprinting through social engineering - Footprinting tools - Network scanning concepts - Port-Scanning tools - Scanning techniques - Scanning beyond IDS and firewall.

UNIT 3 ENUMERATION AND VULNERABILITY ANALYSIS

9 Hrs.

Enumeration concepts - NetBIOS enumeration – SNMP, LDAP, NTP, SMTP and DNS enumeration - Vulnerability assessment concepts - Desktop and server OS vulnerabilities - Windows OS vulnerabilities - Tools for identifying vulnerabilities in windows- Linux OS vulnerabilities- Vulnerabilities of embedded OS.

UNIT 4 SYSTEM HACKING

9 Hrs.

Hacking web servers - Web application components- Vulnerabilities - Tools for web attackers and security testers - Hacking wireless networks - Components of a wireless network- Wardriving- Wireless hacking - Tools of the trade.

UNIT 5 NETWORK PROTECTION SYSTEMS

9 Hrs.

Access control lists. - Cisco adaptive security appliance firewall - Configuration and risk analysis tools for firewalls and routers - Intrusion detection and prevention systems - Network based and host-based IDSs and IPSs - Web filtering - Security incident response teams - Honeypots.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1 - Express knowledge on basics of computer-based vulnerabilities
- CO2 - Understand the different foot printing, reconnaissance and scanning methods.
- CO3 - Demonstrate the enumeration and vulnerability analysis methods
- CO4 - Gain knowledge on hacking options available in Web and wireless applications.
- CO5 - Acquire knowledge on the options for network protection.
- CO6 - Use tools to perform ethical hacking to expose the vulnerabilities.

TEXT / REFERENCE BOOKS

1. Michael T. Simpson, Kent Backman, and James E. Corley, Hands-On Ethical Hacking and Network Defense, Course Technology, Delmar Cengage Learning, 2010.
2. Patrick Engebretson, "The Basics of Hacking and Penetration Testing", Syngress, Elsevier, 2013.
3. Dafydd Stuttard and Marcus Pinto, "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", 2011.
4. Justin Seitz, "Black Hat Python: Python Programming for Hackers and Pentesters", 2014

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

SCSB1262	BLOCKCHAIN AND CRYPTOCURRENCY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To impart technical understanding of blockchain technologies, basics of Ethereum that helps developers publish distributed applications
- To learn various aspects of working and use of bitcoin and transfer of money for medium of exchange
- To provide knowledge on security and privacy of blockchain technologies

UNIT 1 INTRODUCTION TO BLOCKCHAIN

9 Hrs.

Peer-to-Peer(P2P) networking - Block chain architecture -Design and integration -Key participants in the block chaining -Blocks in blockchain -Types of blockchain - Logical components of blockchain - Core components of blockchain architecture -Smart contracts and their applications.

UNIT 2 ETHEREUM BASICS

9 Hrs.

Ethereum and smart contracts - Turing completeness of smart contract languages and verification challenges - Using smart contracts to enforce legal contracts - Comparing bitcoin scripting vs. Ethereum smart contracts - Writing smart contracts using Solidity and JavaScript.

UNIT 3 INTRODUCTION TO BITCOIN

9 Hrs.

Bitcoin features - Blockchain and Bitcoin - Bitcoin security - Bitcoin transaction - Transaction lifecycle - Consensus Protocol - Role of Bitcoin crimes - Dark side of Bitcoin crimes - Open challenges to bitcoin Crimes.

UNIT 4 FUNDAMENTALS OF CRYPTOCURRENCIES

9 Hrs.

Nodes - P2P – Ledger - Gossip protocol - Consensus methods – Messages - Account balance - Genesis block and new coins - How a crypto currency works - Crypto currency exchange - Smart contracts - E-Governance.

UNIT 5 SECURITY AND PRIVACY ISSUES OF BLOCKCHAIN TECHNOLOGY

9 Hrs.

Introduction - Blockchain aspects for consideration -Security of blockchain, Privacy of blockchains, Security issues of blockchain technology, Privacy issues of blockchain technology, Types of attacks, Security enhancement to blockchain systems, Applications of blockchain in healthcare, finance.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1 - Understand the concepts of blockchain technologies.
- CO2 - Implement Ethereum block chain contract.
- CO3 - Illustrate the concepts of bitcoin and their usage.
- CO4 - Understand basic principles of Crypto currencies.
- CO5 - Apply security features in blockchain technologies.
- CO6 - Use smart contract in real world applications.

TEXT / REFERENCE BOOKS

1. Tapscott, Don, Tapscott, Alex, "Blockchain Revolution How the Technology Behind Bitcoin and Other Cryptocurrencies Is Changing the World", Penguin,
2. Merunas Grincalaitis, "Mastering Ethereum: Implement Advanced Blockchain Applications using supported Tools, Services, and Protocols", Packt Publishing,
3. Raj, Pethuru Saini, Kavita Surianarayanan, Chellammal, "Blockchain Technology and Applications",
4. Melanie Swan, "Blockchain Blueprint for a New Economy",
5. Shi o Kim, Ganesh Chandra Deka, "Advanced Applications of Blockchain Technology", 2019.
6. Rajneesh Gupta, "Hands -On Cybersecurity with Blockchain Implement DDoS based identity, 2FA, and DNS security using Blockchain protection, PKI-
7. Martin Quest, "Cry , 2018 .
8. and Bitcoin Trading, "Cryptocurrency Master Everything You Need to Know About
9. Narayanan, Bonneau, Felten, Miller and Goldfeder, "Bitcoin and Cryptocurrency Technologies A sive Introduction", Princeton University Press,
10. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.
10. Imran Bashir, "Mastering Blockchain: Distributed ledger technology, contracts explained", Packt Publishing, and smart

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

SCSB3008	CYBER FORENSICS AND INFORMATION SECURITY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To impart knowledge on cybercrime and cyber forensics.
- To learn about cyber investigation and evidence management.
- To understand digital forensics.

UNIT 1 UNDERSTANDING THE THREAT FROM CYBER CRIME

9 Hrs.

Introduction to cyber threat – Definition of cyber crime – Classification – Current threats and trends – Diversity of cyber crime – Cyber hate crimes – Cyber terrorism.

UNIT 2 RESPONDING TO CYBER CRIME

9 Hrs.

Cyber strategy – National security strategy – Cyber security strategy – Organized crime strategy – Cyber crime strategy – Policy cyber crime – International response – National cyber security structure – Strategic policy requirements – Police and crime commissioners.

UNIT 3 INVESTIGATING CYBER CRIME

9 Hrs.

Preventing cyber crime – Password protection – Get safe online – Cyber security guidance for Business – Cyber crime investigation skills – Criminal investigation – Code of ethics – Evidence – Hi Tech Investigations – Capturing and analysing digital evidence.

UNIT 4 DIGITAL FORENSICS

9 Hrs.

Introduction to Digital Forensics - Forensic software and hardware - Analysis and advanced - tools forensic technology and practices - Forensic ballistics and photography - Face, iris and fingerprint recognition - Audio video analysis - Windows system forensics - Linux system forensics - Network forensics.

UNIT 5 CASE STUDY

9 Hrs.

Latest study topics on cybercrime and investigations- Recent cybercrime cases – Recent digital forensics cases – Bridging the gaps in cybercrime investigations between the cyber security stake holders.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1** - Infer the various ideas about cybercrime.
- CO2** - Describe the cybercrime strategy.
- CO3** - Identify the cybercrime investigation methodology.
- CO4** - Analyse and validate forensics data.
- CO5** - Develop security architecture for an organization.
- CO6** - Apply the concepts of cybercrime and digital forensics in real time scenarios.

TEXT / REFERENCE BOOKS

1. Thomas Halt, Adam M. Bossler and Kathryn C. SeigfriedSpellar, "Cybercrime and Digital Forensics: An Introduction II", Routledge Taylor and Francis Group, 2017.
2. Bernadette H Schell, Clemens Martin, "Cybercrime ABC", CLIO Inc, California, 2004, EBOOKS:https://books.google.co.in/books/about/Cybercrime_and_Digital_Forensics.html?id=7SA6DwAAQBAJ&redir_esc=y.

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**

SCSB1372	SECURED NETWORK PROTOCOLS AND STANDARDS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts of different layers of protocols.
- To provide knowledge and overview about cyber physical system and IoT.
- To make students aware of various cyber risk assessment and threats.

UNIT 1 INTRODUCTION

9 Hrs.

Introduction (overview of network security issues, cryptographic algorithms, authentication techniques)
 - Layer 2/3 security - Authentication systems - Key establishment protocols - Kerberos- Secure communication at the data link and network layers (IPSEC and IKE) - Secure communication at the transport and application layers (SSL/TLS, email security, PGP) - Vulnerabilities of Internet protocols.

UNIT 2 PROTOCOLS

9 Hrs.

Secure Sockets Layer (SSL) - SSL Protocol Stack - SSL Record Protocol Operation IP Security (IPsec)
 - IP Security (IPsec) architecture - Benefits of IPsec Hypertext Transfer Protocol Secure (HTTPS) Kerberos
 - Drawbacks and limitations - Kerberos Vulnerabilities Transport Layer Security (TLS).

UNIT 3 ATTACKS AND THREATS

9 Hrs.

Denial of service (DoS) attacks and defences - Firewalls, IP spoofing prevention - Routing protocols security and router security - Domain name server (DNS) security - Traffic monitoring, Intrusion detection, Honeypots - Wireless networks security - Spam, Phishing, and Pharming - Malware propagation and containment, Botnets - Anonymity and privacy on the Web.

UNIT 4 SECURITY IN NEXT GENERATION SYSTEM

9 Hrs.

Internet Security Protocols and Standards - TCP Attacks, DNS Vulnerabilities, SSL/TLS, DDoS - Next Generation System Designs and Challenges - Cyber-physical system overview and security - Internet of Things and smart grid security - Data and infrastructure security in cloud/edge computing.

UNIT 5 CYBER RISK ASSESSMENT

9 Hrs.

Blockchain and decentralized applications- Hash cash and other consensus protocols - Blockchain Security- Smart contracts - Scalability and privacy challenges - Security economics and risk modelling - Cyber-risk assessment - Threat information sharing - Cyber-insurance .

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1 - Analyse the security issues and authentication algorithms.
- CO2 - Express the various protocols in different layers.
- CO3 - Explain the use of different attacks and security mechanism in current networking scenario.
- CO4 - Analyse the security issues in IoT and smart grid applications.
- CO5 - Evaluate the security methods using blockchain.
- CO6 - Analyse the cyber risk assessment.

TEXT / REFERENCE BOOKS

1. Uyless D. Black, "Computer Networks: Protocols, Standards and Interface", 2nd Edition, 2015.
2. James F Kurose and Keith W. Ross, "Computer Networking - A Top-Down Approach", Addison-Wesley, 5th Edition, 2010.
3. L. Peterson and B. Davie, "Computer Networks: A Systems Approach", Elsevier Inc., 5th

4. Edition, 2011.
William Stallins," Network Security Essentials: Applications and Standards", Pearson Publication, 2016.
5. Yassine Maleh , " Security and Privacy Management, Techniques, and Protocols", morocco, 2018.

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

SITA3003	ADVANCED JAVA PROGRAMMING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To know about Enterprise architecture models
- To introduce the basics of session tracking
- To understand JSP and to write Custom Tags
- To know about the development of Enterprise Java Beans
- To have knowledge advanced Java programming concepts like struts

UNIT 1 INTRODUCTION AND DATABASE PROGRAMMING

9 Hrs.

J2EE Platform – Enterprise architecture styles – J2EE run times – J2EE API – J2EE architecture – Containers – Introduction to J2EE technologies – Naming and directory services. Database programming with JDBC – JDBC/ODBC Bridge – Establishing a connection – Creating and executing SQL statements – Querying – Report statements – Scrollable and updatable result sets – Java.sql packages – JDBC data sources – Connection pooling.

UNIT 2 SERVLET PROGRAMMING

9 Hrs.

Introduction to Servlet Programming - Servlet Implementations - Servlet configuration - Servlet exceptions - Servlet Life Cycle - Servlet Programming - Servlet Security- Servlet communication - Advanced Servlets : Approach to Session Tracking
- Demonstrating Session - Lifecycle with Cookies - A simple shopping cart using Sessions - Servlet Context Interface - Servlet Collaboration

UNIT 3 JSP AND JAVA MAIL

9 Hrs.

Java Server Pages : Intro to JSP - JSP Directives - Scripting elements - Standard Auctions - Implicit objects - Scope - JSP pages as XML documents - JSP Sample Program - Design Strategies - JSP tag Extensions-A simple TAG - Writing TAG Extensions. Java Mail API: Introduction to Java Mail - Mail Protocols- Java Mail Overview- Quick, Send me a Email: An example program

UNIT 4 ENTERPRISE JAVA BEANS

9 Hrs.

Overview of EJB-EJB Middleware Architecture - EJB Architecture- EJB Containers and its services - Design of EJB Tier - Session java Beans- Stateless and Stateful Beans, Entity Beans and Persistence - Container Vs Bean Managed Persistence, Message Driven Bean - Relationships, EJB Container Services.

UNIT 5 STRUTS

9 Hrs.

Struts: Development Models-Basic Components of Struts – Struts2 Architecture-Interceptors-Validation- Building simple struts Application.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1:** Implement JDBC connectivity
- CO2:** Implement Servlets and advanced Servlets
- CO3:** Implement JSP and Java Mail
- CO4:** Implement EJB
- CO5:** Implement Struts
- CO6:** To develop enterprise java applications thereby meeting the industrial requirements

TEXT / REFERENCE BOOKS

1. Subrahmanyam Allamaraju and Cedric Buest , "Professional Java Server Programming", A press,J2EE 1.3, 2007.

2. Jim Keogh ,”Completer Reference, J2EE”,Tata McGraw Hill, 2007.
3. James Holmes-Structs,”The complete Reference”, 2nd Edition, Tata McGraw Hill, 2007.
4. <http://www.java.sun.com/tutorial>

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

SITB3001	ADVANCED JAVA PROGRAMMING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To introduce the basics of enterprise architecture models and session tracking.
- To understand JSP and to write custom tags.
- To impart knowledge on the development of Enterprise Java Beans and advanced Java programming concepts.

UNIT 1 INTRODUCTION AND DATABASE PROGRAMMING 9 Hrs.

J2EE Platform – Enterprise architecture styles – J2EE run times – J2EE API – J2EE architecture – Containers – Introduction to J2EE technologies Naming and directory services. Database programming with JDBC – JDBC/ODBC bridge – Establishing a connection – Creating and executing SQL statements – Querying – Report statements – Scrollable and updatable result sets – Java.Sql packages – JDBC data sources – Connection pooling.

UNIT 2 SERVLET PROGRAMMING 9 Hrs.

Introduction to Servlet Programming - Servlet implementations - Servlet configuration - Servlet exceptions - Servlet life cycle - Servlet programming - Servlet security- Servlet communication - Advanced servlets: Approach to session tracking- Demonstrating session - Lifecycle with cookies - A simple shopping cart using sessions - Servlet context interface - Servlet collaboration.

UNIT 3 JSP AND JAVA MAIL 9 Hrs.

Java Server Pages: Intro to JSP - JSP directives - Scripting elements - Standard auctions - Implicit objects - Scope - JSP pages as XML documents - JSP sample program - Design strategies - JSP tag Extensions- A simple TAG - Writing TAG extensions. Java Mail API: Introduction to java mail - Mail protocols- Java mail overview- Quick, Send me a Email: An example program.

UNIT 4 ENTERPRISE JAVA BEANS 9 Hrs.

Overview of EJB-EJB Middleware Architecture - EJB architecture- EJB containers and its services - Design of EJB tier - Session java beans- Stateless and stateful beans, Entity beans and persistence - Container Vs bean managed persistence, Message driven bean - Relationships, EJB container services.

UNIT 5 SPRING FRAMEWORK 9 Hrs.

Introduction to Spring - spring framework architecture - Spring MVC-Spring ORM - IOC container -Spring event handling - Introduction to Hibernate - Spring JDBC - Hibernate mappings - Spring MVC web framework - Spring AOP framework.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Implement JDBC connectivity.
- CO2** - Implement advanced servlets.
- CO3** - Implement JSP and Java Mail.
- CO4** - Implement EJB.
- CO5** - Implement Java,J2EE applications using Spring framework.
- CO6** - Develop enterprise java applications thereby meeting the industrial requirements.

TEXT / REFERENCE BOOKS

1. Subrahmanyam Allamaraju and Cedric Buest, "Professional Java Server Programming J2EE 1.3 Edition", Apress, 2007.
2. Jim Keogh, "Completer Reference, J2EE", Tata McGraw Hill, 2007.
3. James Holmes- Struts, "The complete Reference", 2nd Edition, Tata McGraw Hill, 2007.
4. <http://www.java.sun.com/tutorial>.
5. Rod Johnson et al, "Professional Java Development with the Spring Framework John Wiley and Sons, 2005.

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

SITB3003	ADVANCED INTERNET TECHNOLOGIES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the search engine functionality and features and develop an optimized search engine which is user interactive.
- To gain knowledge on the various elements of web forms development.
- To learn about the recent technological aspects implemented for a modernized Internet Application.

UNIT 1 SEARCH ENGINE OPTIMIZATION AND ITS OBJECTIVES

9 Hrs.

Search Engine Basics - Introduction to SEO - Layout of search result pages - Algorithm-based ranking system - Search engine success factors - Determining search intent and delivering relevant and fresh content - Analyzing ranking factors - Using advanced search techniques - Vertical search techniques - Country-specific search engines - Determining SEO objectives

UNIT 2 DEVELOPING AN SEO FRIENDLY WEBSITE

9 Hrs.

Accessibility of website to search engine - Defining your site's information architecture - Site auditing to identify SEO problems - Web analytics and current server statistics software - Determining top competitors in SEO - Search engine indexing status - Benchmarking current rankings, traffic source, and volumes - Conduct SWOT analysis - Keyword generation - Using google analytics - Creating and optimizing pay-per-click campaigns.

UNIT 3 RESPONSIVE WEB DESIGNING WITH HTML5 AND CSS3

9 Hrs.

Getting started with HTML5, CSS3, and responsive web design - Media queries - Supporting differing viewports - Embracing fluid layout - Flexible images - Proportion-based grids - HTML 5 for responsive design - Basics of CSS3 - CSS3 selectors - Pseudo-classes and pseudo-elements - Typography - CSS color modes - Stunning aesthetics with CSS3 - CSS3 transitions - CSS3 transformations Animations.

UNIT 4 FORMS WITH HTML5 AND CSS3

9 Hrs.

Exploring the FORM element - Exploring the INPUT element - Exploring the BUTTON element - Exploring the multiple-choice elements - Exploring the TEXTAREA and LABEL elements - Exploring the FIELDSET and LEGEND elements - Describing the DATALIST element - Submitting a form - Styling HTML5 forms with CSS3

UNIT 5 RICH INTERNET APPLICATION (RIA) AND MASHUP

9 Hrs.

Characteristics of RIA - Moving from web 1.0 to web 2.0 - Web mashup ecosystems - Mashup technologies - RIA: AJAX versus traditional approach - Technical background.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Develop understanding on search engines and its optimised functionalities.
- CO2 - Design a user-friendly search engine with standard features.
- CO3 - Apply the various trending web applications features with its new improvements.
- CO4 - Explore the numerous elements of web forms and its features.
- CO5 - Gain knowledge on the trending technologies implemented in industries.
- CO6 - Design web pages for real time scenarios.

TEXT / REFERENCE BOOKS

1. Deven Shah, "Advanced Internet Technology", DT Editorial Services, Dreamtech Press, 2014.
2. Uyless D. Black, "Advanced Internet Technologies", Prentice Hall Series in Advanced Communications Technologies, 1998.
3. Rajkamal Sangole, "Advanced Internet Technologies", Vision Publications, 2020.
4. Mr. Kamil Ajmal Khan, Dr. Pallawi Bulakh, Nirali Prakashan, "Advanced Internet Technologies", 2020.
5. Sergei Dunaev, Advanced Internet Programming: Technologies and Applications, CharlesRiver Media, Inc., 2001.

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

SITB3005	BEGINNER FULL STACK WEB DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the fundamentals of web programming, client side scripting and server side development.
- To understand API development with Express framework, architect databases using NoSQL and SQL databases.
- To learn the advanced client side scripting and ReactJS framework.

UNIT 1 WEB DEVELOPMENT USING HTML 9 Hrs.

Clients, Servers, and Communication - The Internet - Basic internet protocols -The World Wide Web- HTTP request message-response - Web clients web servers- Introduction to HTML - Browsers and HTML - Editor's offline and online - Tags, Attribute and elements - Doctype element- Comments -headings, paragraphs, and formatting text - Lists and links - Images and tables.

UNIT 2 CSS 9 Hrs.

Introduction CSS - Applying CSS to HTML - selectors, properties and values - CSS colors and backgrounds - CSS box model - CSS margins, padding, and borders - CSS text and font properties - CSS general topics.

UNIT 3 INTRODUCTION TO JAVASCRIPT 9 Hrs.

Introduction to JavaScript - Applying JavaScript (internal and external) - Understanding JS syntax - Introduction to document and window object - Variables and operators -Data types and Num type conversion -Math and string manipulation -Objects and arrays - Date and time -Conditional statements - Switch case - Looping in JS Functions.

UNIT 4 JQUERY AND SERVER-SIDE JS FRAMEWORK – NODE.JS 9 Hrs.

Introduction – jQuery selectors – jQuery HTML - Animations – Effects – Event handling – DOM – jQuery DOM traversing, DOM manipulation – jQuery AJAX- Introduction - What is Node JS – Architecture – Feature of Node JS - Installation and setup - Creating web servers with HTTP (Request and Response) – Event handling - GET and POST implementation - Connect to SQL database using Node JS.

UNIT 5 INTRODUCTION TO ADVANCED CLIENT SIDE PROGRAMMING 9 Hrs.

React JS: ReactDOM - JSX - Components - Properties –Fetch API - State and lifecycle - JS local storage - Events - Lifting state up - Composition and inheritance.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, the student will be able to

- CO1** - Write client side scripting using HTML, CSS and JS.
- CO2** - Implement and architect the server side of the web application.
- CO3** - Implement Web Application using NodeJS.
- CO4** - Architect NoSQL databases with MongoDB.
- CO5** - Implement a full-stack single page application using React, NodeJS
- CO6** - Apply advanced client side scripting and ReactJS framework to develop applications.

TEXT / REFERENCE BOOKS

1. The Definitive Guide”, O'Reilly David Flanagan, “Java Script: Media, Inc, 7th Edition, 2020.
2. Matt Frisbie, "Professional JavaScript for Web Developers", Wiley Publishing, Inc, 4th Edition, ISBN: 978-1-119-36656-0, 2019.
3. Alex Banks, Eve Porcello, "Learning React", O'Reilly Media, Inc, 2nd Edition, 2020.
4. Marc Wandschneider, “Learning Node”, Addison-Wesley Professional, 2nd Edition, 2016.
5. Joe Beda, Kelsey Hightower, Brendan Burns, “Kubernetes: Up and Running”, O'Reilly Media, 1st edition, 2017.

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

SITB3006	UI / UX DESIGN	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To provide students with the knowledge of user-centered design, graphic design on screens, simulation and prototyping techniques, usability testing methods, interface technologies and user centered design in corporate perspective.
- The course is organized around a practical project with iterative design of a graphical user interface to organize information about users into useful summaries with affinity diagrams.
- To convey user research findings with personas and scenarios and to learn the skill of sketching as a process for user experience design.

UNIT 1 INTRODUCTION TO UI

9 Hrs.

What is User Interface Design (UI) -Relationship between UI and UX , Roles in UI/UX, A brief historical Overview of interface design, Interface conventions, Approaches to screen based UI, Template vs Content, Formal elements of interface design, Active elements of interface design, Composing the elements of interface design, UI design process, Visual communication design component in interface design.

UNIT 2 INTRODUCTION TO UX

9 Hrs.

UX Basics - Foundation of UX design - Good and poor design - Understanding your users - Designing the experience - Elements of user experience - Visual design principles - Functional layout - Interaction design - Introduction to the interface - Navigation design - User testing -Developing and releasing your design.

UNIT 3 WIREFRAMING FOR UI DESIGNERS

9 Hrs.

Wire framing - Why and how to create wireframes - Issues to solve steps in creating a wireframe Designing on a Grid System (like Bootstrap) - Get critiques incorporate feedback and improve your designs - Wireframe to refined design iterate and refine - Understanding the mobile experience.

UNIT 4 UI OR VISUAL DESIGN CONCEPTS

9 Hrs.

Color Harmonies - Creating contrast with color guidelines for proper color usage - Typography and Fonts Display Text (Such as Headings) versus Body Text Legibility Type Trends Typeface Selection and Pairing Where to Get Web Fonts Ideal Line Height Column Width (Line Length) Hyphenation and Justification Design Elements Proximity Similarity Continuity.

UNIT5 THE BUSINESS OF UX and UI DESIGN

9 Hrs.

UX and UI design industry getting into the business - Strategies and ideas - Resources - Creating your portfolio website - Examples of UX and UI portfolio websites - What you should include on your portfolio website - Get 1-on-1 feedback on your case studies and portfolio website -Resume development what you should include on your resume - Get 1-on-1 feedback on your resume.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to:

- CO1** - Understand the definition and principles of UI/UX Design in order to design with intention.
- CO2** - Achieve a deep understanding of the entire life cycle of design —the process, purpose, and tools.
- CO3** - Discover the industry-standard tools and specific project deliverables in UI/UX.
- CO4** - Explain why you made design decisions, through presentations of assignments.
- CO5** - Apply the user Interfaces to different devices and requirements,
- CO6** - Create high quality professional documents and artifacts related to the design process.

TEXT / REFERENCE BOOKS

1. Harvey and Paul Deitel and Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web - How to Program", 5th Edition, Pearson Education, 2011
2. Achyut S Godbole and Atul Kahate, "Web Technologies", 2nd Edition, Tata McGraw Hill, 2012.
3. Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", 3rd Edition, Tata McGraw Hill, 2013
4. Jesse James Garrett, "The Elements of User Experience: User-Centered Design for the Web and Beyond", 2nd Edition, Pearson Education. 2011.
5. Wilbert O. Galitz, "The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques", 3rd Edition, Wiley Publishing, 2007.
6. Rex Hartson and Pardha S. Pyla, "The UX Book Process and Guidelines for Ensuring a Quality User Experience", Elsevier, 2012.

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

SITB3007	WEB DEVELOPMENT BOOTCAMP	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To create web application using cutting edge technologies.
- To learn about JavaScript, functions and invocation patterns.
- To master backend development with Node JS.

UNIT 1 INTRODUCTION TO HTML AND CSS

9 Hrs.

Fundamentals/ basic HTML - Text formatting on web pages – Hyperlinks - Complex image maps - tables and nested tables - Inserting web page - Setting and modifying field properties - Validating HTML - Designing with style sheets - Style Sheet Syntax - ID - Class Contextual Selectors - Cascading Order – Properties.

UNIT 2 INTRODUCTION TO JAVASCRIPT

9 Hrs.

Data Types - Javascript variables - Naming and naming conventions for Javascript variables - String concatenation - String lengths and retrieving the number of characters - Basic arithmetic and the modulo operator in Javascript - Increment and decrement expressions - Functions and invocation patterns - Intermediate JavaScript - JS objects and prototypes.

UNIT 3 DOCUMENT OBJECT MODEL (DOM) AND JQUERY

9 Hrs.

Tree structure of HTML based websites - Manipulate and change the HTML elements using DOM - Installing and using the jQuery framework - jQuery functionality Selectors HTML manipulation

UNIT 4 BOOTSTRAP

9 Hrs.

Fundamentals of UI design for websites - Bootstrap framework - Bootstrap grid layout system-Bootstrap CSS buttons Bootstrap CSS forms Bootstrap CSS tables - Bootstrap navigation bars

UNIT 5 NODE JS

9 Hrs.

Components of back-end development - Apply concepts like data types, objects, methods, object-oriented programming and classes in the context of backend development - Server-side JavaScript - JavaScript build processes - File system interaction

Max. 45 Hrs.

COURSE OUTCOMES

Upon completion of the course the student will be able to

CO1 - Understand how website work and how HTML, CSS contribute.

CO2 - Design user interactions on web pages.

CO3 - Develop back end website applications.

CO4 - Prepare mock-ups and storyboards for a web development project.

CO5 - Explore new methods of development in web applications and programming languages.

CO6 - Manage a project from conception to finished product.

TEXT / REFERENCES BOOKS

1. Shama Hoque, "Full-Stack React Projects: Learn MERN Stack Development by Building Modern Web Apps Using MongoDB, Express, React, and Node.js , "2nd Edition 2020.
2. Frank Zammetti, Modern Full-Stack Development: Using TypeScript, React, Node.js , Webpack, and Docker, 2020.
3. <https://www.javatpoint.com/document-object-model>.
4. <https://www.geeksforgeeks.org/how-do-you-run-javascript-script-through-the-terminal>.

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**

SITB3008	INTRODUCTION TO JAVASCRIPT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn to use best-practice idioms and patterns.
- To understand concepts commonly used in dynamic language programming, such as introspection, higher-order functions, closures and advanced language features such as prototypical inheritance.
- To become adept at implementing client-side interfaces through the use of the DOM, jQuery and AJAX.

UNIT 1 INTRODUCTION AND LANGUAGE SYNTAX

9 Hrs.

Java Script –Advantages Variable declaration operators - Control statements - Error handling - Understanding arrays.

UNIT 2 FUNCTIONS

9 Hrs.

Function declaration and invocation syntax - Anonymous functions - Functions as data- The arguments object - Variadic functions - Optional parameters - Named parameters - Function overloading - Duck typing.

UNIT 3 HTML FORMS AND DOM

9 Hrs.

Tags - Document structure – Elements - Text, forms, images, blocks and frames – Selectors- Cascading and inheritance - Text and color types - The box model-Layout -The DOM as a document API - Browser information - The setTimeout and setInterval - Element lookup - Tree traversal -Attribute getting and setting - Creating and deleting nodes - Events.

UNIT4 AJAX WITH JQUERY

9 Hrs.

Overview of jQuery - Cross-browser compatibility -The \$ function object - Element selectors - Tree traversal -Node creation, insertion, modification and deletion - Getting and setting attributes, styles and class - Wrapping and unwrapping DOM raw objects-AJAX - Asynchronous communication - Callback functions - The get and post formats - Same-origin policy - Cross-origin requests with JSONP - AJAX polling.

UNIT5 NODEJS

9 Hrs.

Server-side scripting - Threaded vs event-based server models -Working with callbacks - Express web framework.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Identify the method required to produce a certain outcome or solve a problem using JavaScript.
- CO2** - Apply invaluable built-in JavaScript methods.
- CO3** - Develop fun, interactive, and dynamic JavaScript web apps, games, and pages.
- CO4** - Identify the method required to produce a certain outcome or solve a problem using JavaScript.
- CO5** - Apply invaluable built-in JavaScript methods.
- CO6** - Develop fun, interactive, and dynamic JavaScript web apps, games, and pages.

TEXT / REFERENCE BOOKS

1. Crockford, Douglas, "JavaScript: The Good Parts.", O'Reilly Media, 2008.
2. Flanagan, David, "JavaScript: The Definitive Guide", O'Reilly Media, 2011.
3. Fulton, Steve, and Fulton, Jeff, "HTML5 Canvas: Native Interactivity and Animation the Web", O'Reilly Media, for 2013.
4. Resig, John, Bibeault, Bear, "Secrets of the JavaScript Ninja", Manning, 2013.
5. Mulder, Patrick, "Full Stack Web Development with Backbone.js: Scalable Application Design with 100% JavaScript.", O'Reilly Media, 2014.
6. Rauschmayer, Axel, "Speaking JavaScript: An In-Depth Guide for Programmers", O'Reilly Media, 2014.

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**

SITB3009	BACK END TOOLS FOR FULL STACK DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To familiarize students with the basics of Back End Development, including programming languages, web servers, databases, and data modelling techniques.
- To introduce students to the various Back End tools and techniques used in developing, testing, and deploying web applications.
- To expose students to real-world case studies of Back End tools and technologies used in creating e-commerce, social media, and financial services applications.

UNIT 1 DEFINITION AND OVERVIEW OF FULL STACK DEVELOPMENT 9 Hrs.

Introduction to full stack development - Overview of full stack development -History and evolution of full stack development - Role of back end tools in full stack development -Role of back end tools in full stack development - Understanding the back end of a web application - Back end tools and technologies. Overview of front end and back end technologies - Front end technologies (HTML, CSS, JavaScript, etc.)

- back end technologies (Programming languages, Web servers, Databases, etc.) - Understanding the interaction between front end and back end.

UNIT 2 PROGRAMMING LANGUAGES FOR BACK END DEVELOPMENT 9 Hrs.

Programming languages for back end development (Java, Python, PHP, Ruby, etc.) - Web servers and frameworks (Node.js, Flask, Django, Rails, etc.) -Databases and data modeling (SQL, NoSQL, ORM, etc.)- RESTful APIs (HTTP, JSON, XML, etc.).

UNIT 3 TOOLS AND TECHNIQUES FOR BACK END DEVELOPMENT 9 Hrs.

Version control with git (creating repositories, branching, merging, pull requests, etc.) - Testing and debugging (unit testing, integration testing, debugging tools and techniques, performance testing, etc.) - DevOps and deployment (continuous integration and deployment, deployment tools, infrastructure as code, containerization with Docker, etc.) - Security in back end development (common security threats, authentication and authorization, encryption and hashing, OWASP top ten vulnerabilities, etc.).

UNIT 4 PERFORMANCE OPTIMIZATION AND SCALABILITY 9 Hrs.

Scaling and performance optimization (horizontal and vertical scaling, load balancing and clustering, caching and content delivery networks, monitoring and optimization, etc.) - Real-time communication with web sockets (understanding web sockets, implementing web sockets with Node.js and Socket.IO, broadcasting and chatting applications, etc.) - Microservices architecture (overview of microservices, benefits and challenges of microservices, implementing microservices with Docker and Kubernetes, service mesh and API gateways, etc.).

UNIT 5 BEST PRACTICES AND FUTURE TRENDS 9 Hrs.

Case studies of back end tools in Real-world applications (e-commerce, social media, financial services, etc.) - Best practices for back end development (clean code, design patterns, error handling, etc.) - Trends and future of back end tools (serverless computing, machine learning, blockchain, etc.)

Max. 45 Hrs.

COURSE OUTCOMES

On successful completion of a course students will be able to

CO1 - Understand the fundamentals of full stack development and the role of back end tools in creating

modern web applications.

- CO2** - Demonstrate proficiency in at least one programming language and web framework commonly used in back end development.
- CO3** - Build RESTful APIs using various Back End tools and techniques, including data interchange formats and HTTP methods.
- CO4** - Implement performance optimization and scalability techniques, including micro services architecture and real-time communication with web sockets.
- CO5** - Analyze and apply Back End tools and technologies to solve real-world problems in e-commerce, social media, and financial services applications.
- CO6** - Identify and evaluate current and future trends in Back End Development, including serverless computing, machine learning, and blockchain.

TEXT / REFERENCE BOOKS

1. Giordani, Leonardo, " Back-End Development with Python and Flask "Packt Publishing, 2018.
2. Freeman, Adam, "Web Development with Node and Express: Leveraging the JavaScript Stack, O'Reilly Media, 2014.
3. Rails, David, et al. , " Agile Web Development with Rails 5", Pragmatic Bookshelf, 2017.
4. Shifflett, Scott, "PHP 7 Programming Cookbook: Over 80 recipes that will take your PHP 7 web development skills to the next level!" Packt Publishing, 2016.
5. Kim, Euseong, et al. , " Django Design Patterns and Best Practices: Industry-standard web development techniques and solutions using Python ", 2nd edition Packt Publishing, 2019.

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

SITB3010	FULL STACK DEVELOPMENT FRAMEWORK	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To become knowledgeable about HTML and CSS.
- To familiarize pupils with the components of JSX and React JS.
- To gain expertise in MongoDB and Python connectivity.

UNIT 1 HTML

9 Hrs.

Introduction to HTML- Browsers and HTML -Editor's offline and online -Tags, Attribute and elements - Doctype element -Comments - Headings, paragraphs, and formatting text - Lists and links - Images and tables.

UNIT 2 CSS AND JAVASCRIPT

9 Hrs.

Introduction CSS - Applying CSS to HTML - Selectors, properties and values - CSS Colors and backgrounds - CSS box model - CSS margins, padding, and borders-CSS text and font properties-CSS general topic. Introduction to JavaScript - Applying JavaScript (internal and external) - Understanding JS syntax - Introduction to document and window ObjectVariables and operators - Data types and Num type conversion - Math and string manipulation - Objects and arrays - Date and time - Conditional statements - Switch case - Looping in JS- Functions.

UNIT 3 REACT JS

9 Hrs.

React JS -Introduction - Templating using JSX - Components, state and props - Lifecycle of components - Rendering list and portals - Error handling - Routers Redux and Redux saga -Immutable.js - Service side rendering - Unit testing - Webpack.

UNIT 4 NODE JS

9 Hrs.

Node js overview - Node js - Basics and setup-Node js console-Node js command utilities - Node js modules - Node js concepts - Node js events - Node js with express js - Node js database access.

UNIT 5 MONGODB AND PYTHON

9 Hrs.

MongoDB - SQL and NoSql concepts - Create and manage MongoDB - Migration of data into MongoDB - MongoDB with PHP - MongoDB with NodeJS - Services offered by MongoDB - Python-Python installation and configuration - Developing a Python ApplicationConnect MongoDB with Python Installation and configuration - Developing a Python application - Connect MongoDB with Python.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Learn basic HTML commands.
- CO2** - Apply CSS commands to design web pages.
- CO3** - Apply JSX-components, lifecycle of components.
- CO4** - Comprehend basics and Setup-Node js.
- CO5** - Connect MongoDB with python.
- CO6** - Develop web pages and validate for real time application.

TEXT / REFERENCE BOOKS

1. Dromey R.G., "How to Solve it by Computer", Prentice Hall of India, 8th Indian Reprint, 2008.
2. Martin C. Brown, "Python: The Complete Reference", McGraw Hill, 2018.
3. John M. Zelle, "Python Programming: An Introduction to Computer Science", Library of

4. Congress.
Deitel and Deitel and — Internet and World Wide Web – Nieto, Howlto Program , Prentice Hall,
5th Edition, 2011.
5. — Web Technologies A Computer Science Perspective|| Jeffrey C and Jackson,
, Pearson
Education, 2011.

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

SCSB3010	INTRODUCTION TO RASPBERRY PI	L	T	P	EL	Credits	Total Marks
	AND ARDUINO	3	0	0	0	3	100

COURSE OBJECTIVES

- To provide skills for interfacing sensors and actuators with different IoT architectures.
- To understand the various means of communication from Node / Gateway to cloud platforms.
- To capable of developing various applications using raspberry pi.

UNIT 1 INTRODUCTION TO SENSORS

9 Hrs.

Sensors - Classification of Sensors - Roles of sensors in IOT - Various types of sensors - Design of sensors - Sensor architecture - Special requirements for IOT sensors - Role of actuators - Types of actuators - Transducers.

UNIT 2 IoT WITH ARDUINO

9 Hrs.

Introduction to the Arduino -About the Arduino Board - Creating an Arduino programming environment, Creating an Arduino program - Using Libraries - Working with digital interfaces - Interfacing with analog devices - Adding interrupts - Communicating with devices using sensors - Working with motors - Using an LCD.

UNIT 3 PROGRAMMING ESP 8266 MODULE

9 Hrs.

ESP 8266 Wi-Fi Serial Module: Overview - Setting up the hardware - Interfacing with Arduino - Creating an IoT temperature and humidity sensor system - Overview of DHT-22 sensor - Interfacing the hardware: Arduino, ESP 8266 Wi-Fi module, and DHT-22 sensor - Checking your data via ThingSpeak- Connecting your Arduino set-up to Blynk via Wi-Fi.

UNIT 4 INTRODUCTION TO RASPBERRY PI

9 Hrs.

Introduction to Raspberry Pi - About the Raspberry Pi board: Hardware layout - Operating systems on Raspberry Pi -Configuring Raspberry Pi - Programming Raspberry Pi with Python - Raspberry Pi interfaces - Controlling LED with Raspberry Pi - Interfacing an LED and switch with Raspberry Pi - Interfacing a light sensor (LDR) with Raspberry Pi - Wireless temperature monitoring system using Pi.

UNIT 5 IoT DESIGN USING RASPBERRY PI

9 Hrs.

IoT applications based on Pi - LAMP Web-server - GPIO control over web browser - Creating custom web page for LAMP - Communicating data using on-board module - Home automation using Pi - Node-RED - MQTT Protocol - Using Node-RED Visual Editor on Rpi.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Understand general concepts of IoT also recognize various devices, sensors and applications.
- CO2** - Create IoT solutions using sensors, actuators and devices.
- CO3** - Demonstrate Arduino programming language and IDE.
- CO4** - Understand the working of Raspberry Pi, its features and how various components can be used with Pi.
- CO5** - Create the Raspberry Pi interfaces with Python.
- CO6** - Design real time IoT Devices.

TEXT / REFERENCE BOOKS

1. Vijay Madiseti and Arshdeep Bahga, Internet of Things (A Hands-On-Approach) , 1st Edition, VPT, 2016.
2. Richard Blum, Arduino Programming in 24 Hours , Sams Teach Yourself, Pearson Education,

- 2017.
3. Paul Scherz and Simon Monk, "Practical Electronics for Inventors", 3rd Edition, 2016.
 4. Omesh Tickoo, Ravi Iyer, "Making Sense of Sensors: End-to-End Algorithms and Infrastructure Design", 2016.
 5. Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.
 6. Eben Upton and Gareth Halfacree, "Raspberry Pi User Guide", August 2016, 4th edition, John Wiley and Sons.

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

SCSB3011	IoT PLATFORMS AND SYSTEM DESIGN	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn about various IoT related protocols, smart objects and IoT architectures.
- To build simple IoT systems using Arduino and Raspberry Pi.
- To develop IoT infrastructure for popular applications.

UNIT 1 INTRODUCTION TO IoT

9 Hrs.

Introduction to IoT - Current technological trends and future prospects - Evolution of IoT - IoT Devices - IoT Devices vs. Computers - Trends in the adoption of IoT - Societal benefits of IoT - Business scope, Relation with embedded system - IoT reference architecture-Physical-logical design of IOT - From M2M to IoT, Software define network.

UNIT 2 IoT PLATFORMS DESIGN METHODOLOGY

9 Hrs.

Introduction - IoT Design and Methodology - Purpose and requirements specification - Process specification - Domain model specification - Information model specification - Service specification - IoT level specification - Functional view specification - Operational view specification - Device and component integration - Application development.

UNIT 3 IoT AND CLOUD

9 Hrs.

Interoperability in IoT - Introduction to Arduino Programming - Integration of sensors and actuators with Arduino Cloud computing in IoT - IoT in cloud architecture - Logging on to cloud- Cloud based IoT platforms - IBM Watson, Google cloud.

UNIT 4 DATA ANALYTICS AND SUPPORTING SERVICES

9 Hrs.

Structured vs unstructured data and data in motion vs data in Rest Role of machine learning- No SQL databases Hadoop ecosystem Apache Kafka - Apache Spark Edge streaming analytics and network analytics - Vivaldi Cloud for IoT, Python web application framework Django- AWS for IoT- System Management with NETCONF-YANG- Cisco IoT system - IBM Watson IoT platform.

UNIT 5 CASE STUDIES / APPLICATION BUILDING WITH IoT

9 Hrs.

Introduction- Smart perishable tracking with IoT and sensors - Smart Healthcare- Elderly fall detection with IoT and sensors - Smart inflight lavatory maintenance with IoT IoT-Based application to monitor water quality - Smart warehouse monitoring - Smart retail-IoT possibilities in the retail sector - Prevention of drowsiness of drivers by IoT - Based smart driver assistance systems - System to measure collision impact in an accident with IoT - Integrated vehicle health management.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand integrating IoT Services to other third party clouds.
- CO2 - Illustrate the application of IoT in various domains.
- CO3 - Interpretation of different IoT platforms design methodology.
- CO4 - Interpret the vision of IoT from a global context.
- CO5 - Apply data analytics and use cloud offerings related to IoT.
- CO6 - Analyze applications of IoT in real time scenario.

TEXT / REFERENCE BOOKS

1. David Hanes, Gonzalo Salguero, Patrick Grossetete, Rob Barton and Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things"

- Cisco Press, 2017.
2. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012.
 3. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach" Orient Black swan Private Limited - New Delhi; 1st edition (2015).
 4. Jan Ho" Iler, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
 5. Hakima Chaouchi, "The Internet of Connecting Objects to the Web" ISBN : 97814821-140-7, Wiley Publications.
 6. Internet of Things, RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan, John Wiley and Sons.

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

SCSB3012	IoT ARCHITECTURE AND ITS PROTOCOLS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand smart objects and IoT architectures.
- To understand design methodology for IoT platforms.
- To learn management and security protocols of IoT.

UNIT 1 INTRODUCTION TO IoT

9 Hrs.

Basics of internet of things (IoT): Introduction to Internet of Things - Physical design of IOT - Logical design of IOT - IOT levels - IOT enabling technologies: Wireless sensor networks - Cloud computing - Big data analytics - Communication protocols - Domain specific IOTs: Home automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Life Style.

UNIT 2 IoT ARCHITECTURE AND DESIGN

9 Hrs.

Drivers – IoT Architecture: oneM2M, IoT World Forum (IoTWF) and alternative IoT models – Simplified IoT Architecture – The core IoT functional stack –IoT data management and compute stack: Fog, Edge and Cloud in IoT.

UNIT 3 IoT DATA LINK AND NETWORK LAYER PROTOCOL

9 Hrs.

IEEE 802.15.4e - IEEE 802.11 - Wireless HART - Z-Wave - Bluetooth Low Energy- Zigbee smart energy- DASH7- HomePlug - G.9959 - LTE-A- LoRaWAN- Weightless-DECT/ULE - Network layer: IPv4 - IPv6 - 6LoWPAN - 6TISCH - ND - DHCP- ICMP RPL CORPL CARP-

UNIT 4 TRANSPORT and SESSION LAYER PROTOCOLS

9 Hrs.

Transport Layer: TCP – MPTCP –UDP –DCCP –SCTP - TLS - DTLS –Session layer: HTTP- CoAP - XMPP - AMQP –MQTT - SMQTT DBS.

UNIT 5 IoT MANAGEMENT AND SECURITY PROTOCOLS

9 Hrs.

Interconnection of heterogeneous datalinks - Smart transducer interface - Security in IoT protocols: MAC 802.15.4 - 6LoWPAN – RPL- TLS-SSL –IoT challenges.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Understand building blocks of Internet of Things and characteristics.
- CO2** - Identify the basics of various IoT architecture.
- CO3** - Analyze applications of IoT in real time scenario
- CO4** - Understand the characteristics of protocols in data link.
- CO5** - Understand the characteristics of protocols in network layers
- CO6** - Apply security mechanism related to IoT.

TEXT / REFERENCE BOOKS

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things", Cisco Press, 2017.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.
3. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach" Orient Black swan Private Limited - New Delhi; 1st edition (2015).
4. Jan Ho" Iler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
5. Hakima Chaouchi, "The Internet of Things Connecting Objects to the Web" ISBN: 978-1-84821-140-7, Wiley Publications.
6. Internet of Things, RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan, John Wiley and Sons.

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**

SCSB3013	WIRELESS TECHNOLOGY, SECURITY AND COMMUNICATION PROTOCOLS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the fundamentals of wireless sensor networks and its application.
- To learn about the issues and challenges in the design of wireless technology.
- To understand the transport layer and security issues possible in ad hoc and sensor networks.

UNIT 1 INTRODUCTION

9 Hrs.

Introduction: Fundamentals of wireless communication technology - Electromagnetic spectrum radio propagation - Characteristics of wireless channels - Modulation techniques - Multiple access techniques - wireless LANs, PANs, WANs, and MANs, Wireless internet. Key definitions of sensor networks - Unique constraints and challenges - Advantages of sensor network - Driving applications - Issues in wireless networks - Issues in design of sensor network - Sensor network architecture - Data dissemination and gathering.

UNIT 2 MEDIUM ACCESS CONTROL PROTOCOLS

9 Hrs.

MAC Protocols: Issues in designing MAC protocols for ad hoc wireless networks - Design goals - Classification of MAC protocols - MAC protocols for sensor network - Location discovery - Quality - other issues - S-MAC - IEEE 802.15.4.

UNIT 3 ROUTING PROTOCOLS

9 Hrs.

Routing Protocols: Issues in designing a routing protocol - Classification of routing protocols- Table-driven - On-demand - Hybrid - Flooding - Hierarchical and power aware routing protocols.

UNIT 4 TRANSPORT AND QoS IN WIRELESS SENSOR NETWORKS

9 Hrs.

Data-Centric and Contention - Based networking - Transport layer and QoS in wireless sensor networks - Congestion control in network processing - Operating systems for wireless sensor networks - Examples.

UNIT 5 SECURITY IN WSN

9 Hrs.

Security attacks-Key distribution and management-Intrusion detection-Software based anti-tamper techniques-Water marking techniques -Defense against routing attacks - Secure ad hoc routing protocols -Broadcast authentication WSN protocols TESLA Biba-Sensor network security protocols - SPINS.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, the student should be able to

- CO1 - Understand the fundamentals of wireless technology.
- CO2 - Technically know how in building a WSN network.
- CO3 - Identify different issues in wireless networks.
- CO4 - Apply the knowledge to identify appropriate physical and MAC layer protocols.
- CO5 - Understand the transport layer and security issues in sensor networks.
- CO6 - Analyse the various critical parameters in deploying a WSN.

TEXT / REFERENCE BOOKS

1. C. Siva Ram Murthy, and B. S. Manoj, "AdHoc Wireless networks ", Pearson Education - 2008.
2. Feng Zhao and Leonides Guibas, "Wireless sensor networks ", Elsevier publication - 2004.

3. Jochen Schiller, "Mobile Communications", Pearson Education, 2nd Edition, 2003.
4. William Stallings, "Wireless Communications and Networks ", Pearson Education – 2004
5. Holger Karl, Andreas willig, "Protocol and Architecture for Wireless Sensor Networks", John wiley publication, Jan 2006.
6. Charles E. Perkins, "Ad Hoc Networking", Addison Wesley, 2000.
7. I.F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci, "Wireless sensor networks: a survey ", computer networks, Elsevier, 2002, 394 - 422.

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

SCSB3014	SENSORS AND ACTUATORS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand basics of sensors, actuators and their operating principle.
- To provide information about interfacing of sensors and signal conditioning circuits to establish any control system or monitoring system.
- To provide knowledge about simulation and characterization of different sensors and to provide an understanding on characteristic parameters to evaluate sensor performance.

UNIT 1 SENSORS/TRANSDUCERS

9 Hrs.

Sensors/Transducers - Principles - Classification - Parameters - Characteristics - Environmental Parameters (EP) - Characterization.
 Mechanical and Electromechanical Sensors: Introduction - Resistive potentiometer - Strain gauge - Inductive sensors - Capacitive sensors - Electrostatic transducer - Force/stress sensors using Quartz resonators - Ultrasonic sensors.

UNIT 2 THERMAL / MAGNETIC SENSORS

9 Hrs.

Gas thermometric sensors - Acoustic temperature sensor - Nuclear thermometer - Magnetic thermometer - Resistance change type thermometric sensors - Thermo emf sensors - The PTAT sensor - Thermal radiation sensors - Quartz crystal thermoelectric sensors.
 Magnetic Sensors: Magneto resistive sensors - Hall effect and sensors - Inductance and Eddy current sensors - Switching magnetic sensors: The Wiegand sensor - The Pulse wire sensor - SQUID sensors.

UNIT 3 RADIATION SENSORS

9 Hrs.

Basic Characteristics - Types of Photosensistors / Photodetectors - X-ray and nuclear radiation sensors - Fibre optic sensors - Recent trends in sensor technologies: Film sensors - Thick film sensors - Thin film sensors - Semiconductor IC technology - Standard methods - Micro electromechanical systems (MEMS) - Nano-sensors.

UNIT 4 SENSORS AND THEIR APPLICATIONS

9 Hrs.

On-board Automobile Sensors - Flow-rate sensors - Pressure sensors - Temperature sensors - Oxygen sensors - Torque and position sensors - Home appliance sensors - Aerospace sensors - Static Pressure sensors - Temperature sensing - Fluid velocity sensors - Sensing direction of air-flow - Measuring air-speed on Aircrafts - monitoring strain - Force, Thrust, and Acceleration - Sensors for manufacturing - Distance sensing - Medical diagnostic sensors - Sensors for environmental monitoring.

UNIT 5 ACUTATORS

9 Hrs.

Actuators: Pneumatic and hydraulic actuation systems - Actuation systems - Pneumatic and hydraulic systems - Directional control valves - Pressure control valves - Cylinders, servo and proportional control valves - Process control valves - Rotary actuators - Mechanical actuation systems - Types of motion - Kinematic chains, Cams, Gears, Ratchet and pawl - Belt and chain drives - Bearings - Mechanical aspects of motor selection - Electrical actuation systems - Electrical systems - Mechanical switches - Solid-state switches - Solenoids - D.C. Motors - A.C. motors - Stepper motors.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, the student should be able to

CO1 - Understand the principle of operation of different sensors and their applications .

CO2 - Be updated on the recent trends in sensor technologies.

- CO3** - Analyze various premises, approaches, procedures and results related to sensors and actuators.
- CO4** - Create analytical design and development solutions for sensors and actuators.
- CO5** - Conduct experiments and measurements in laboratory and on real components, sensors and actuators.
- CO6** - Describe development and application of sensors and actuators and take part in team work and be able to independently present various professional materials.

TEXT / REFERENCE BOOKS

1. D. Patranabis, "Sensors and Transducers", PHI Learning Private Limited.
2. W. Bolton, "Mechatronics", Pearson Education Limited.
3. Sergej Fatikow and Ulrich Rembold, " Microsystem Technology and Microbotics", First edition, Springer Verlag Newyork, Inc, 1997.
4. Jacob "Hand Book of Modern Sensors: Fraden, Physics, Designs and Application"
4th edition, Springer, 2010.
5. Robert H Bishop, "The Mechatronics Hand Book", CRC Press, 2002.

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

SCSB3016	BLOCKCHAIN TECHNOLOGY FOR BUSINESS	L	T	P	EL	Credits	Total Marks
	INNOVATION AND APPLICATIONS	3	0	0	0	3	100

COURSE OBJECTIVES

- To know how the structures and architecture of firms in blockchain.
- To learn about collaborations of society in blockchain.
- To develop blueprint for new social contract and understand various trust models.

UNIT 1 INTRODUCTION TO BUSINESS MODELS

9 Hrs.

Business models - Opportunities for blockchain to disrupt or displace traditional centralized business models - Bitcoin - Double spending problem - No-censorable content - Trustless transactions - Smart contracts and autonomous agents.

UNIT 2 BLOCKCHAIN AND THE C-SUITE

9 Hrs.

Blockchain and the C-Suite - How blockchain changes the deep structures and architecture of the firm - Impact of block chain on management and the roles of the C-Suite - Navigating the balance between blockchain's hype and its true potential - Impact of blockchain technologies on businesses.

UNIT 3 THE NEXT ERA

9 Hrs.

Leadership for the Next Era - Blockchain as a tool - Costless verification - Blockchain technology and last mile problem - Self-governance of blockchain through collaborations of civil society, private sector, government, and stakeholders in non- state networks - The idea of blockchain governance networks - How blockchain governance networks can support blockchain stewardship at three levels - The platform level - The application level, and the ecosystem level - The conditions that are necessary for a blockchain - based hub of innovation to succeed.

UNIT 4 DIGITAL CONTRACTING

9 Hrs.

Blueprint for a New Social Contract - Digital revolution unfolds - Global economy - Labour markets, old institutions, and society as a whole - The potential of the blockchain revolution - Need of business leader collaboration in a new social contract - Self-sovereign identity and web3.0 technological stack - Bootstrapping network effects through blockchain technology and crypto economics.

UNIT 5 THE FUTURE OF BLOCKCHAIN TECHNOLOGY

9 Hrs.

Trust and vulnerability - impact of AI on block chain - Digital privacy - Short history of the scaling out of human trust - High and low trust societies - Types of trust model: Peer-to-Peer, Leviathan, and Intermediary.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Analysis opportunity in blockchain properly.
- CO2** - Able to implement any problem by writing their own business idea.
- CO3** - Define a Suitable Model.
- CO4** - Analyzing business and propose model in blockchain.
- CO5** - Design an efficient blockchain business administrator.
- CO6** - Realize the trust and vulnerability in block chain.

TEXT / REFERENCE BOOKS

1. Drescher, Daniel., "Blockchain Basics: A Non-Technical Introduction in 25 Steps", Apress, 2017.

2. Narayanan, Arvind., Bonneau, Joseph., Felten, Edward., Miller, Andrew., Goldfeder, Steven,
“ Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University
Press, 2016.

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

SCSB3017	CYBER DIGITAL TWIN	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To gain knowledge in cyber security and digital firmware.
- To understand about Risk Management and Twin Constructions.
- To make students aware of security concerns while implementing cyber digital twin technology.

UNIT 1 INTRODUCTION

9 Hrs.

Introduction - Cyber Digital Twin - Definition – Benefits - Need for digital twin - Working principle - Digital thread - Digital shadow - Building blocks of digital twin - Digital twin technology drivers and enablers.

UNIT 2 DATA MODELLING ENVIRONMENT

9 Hrs.

Types of digital twin - Based on Product and Process - Based on Functionality - Based on Maturity - Development considerations - Overview of Data Modelling Environment - Model and data management
- Managing data - Implementing the model - Cloud and IOT technologies.

UNIT 3 DIGITAL TWIN OPTIMIZATION

9 Hrs.

Cyber range vs digital twin - Human behavior modelling in digital twin - Optimization using digital twin - Digital twin and cyber security - Techniques. Technologies - Industrial IOT and Digital Twin - Simulation and Digital Twin - Machine Learning and Digital Twin - Virtual Reality and Digital Twin - Cloud Technology and Digital Twin.

UNIT 4 RISK MANAGEMENT

9 Hrs.

Digital Twin and Risk Assessment - Digital Twin reference model Implementation - Development of risk assessment plan - Development of communication and control system - Development of digital twin tools Integration - platform validation Difficulties - Practical implications.

UNIT 5 APPLICATIONS

9 Hrs.

Applications: Digital Twin in Manufacturing - Digital Twin in Automotive - Digital Twin in Healthcare - Digital Twin in Utilities - Digital Twin in Construction - Digital Twin in Education - Digital Twin in Medicine.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Implement fundamental Cyber System and Digital Twin Technology
- CO2 - Understand types and data modeling of Digital twin
- CO3 - Understand the optimization, simulation and validation
- CO4 - Identify the risks and Control development
- CO5 - Understand the application in different fields
- CO6 - Develop applications using Cyber Digital Twin Technologies

TEXT / REFERENCE BOOKS

1. Michael E. Auer Kalyan Ram B.Digital “ Cyber-physical System and Digital Twins” - Part of the Lecture Notes in Networks and Systems book series.
2. Nassim Khaed, Bibin Pattel and Affan Siddiqui, “ Development and Deployment on the Cloud”, Elsevier, 2020.
3. Hacking Exposed Industrial Control Systems: ICS and SCADA Security Secrets & Solutions (1st Edition), by Clint Bodungen, Bryan Singer, Aaron Shbeeb, Kyle Wilhoit, and Stephen Hilt, ISBN: 978-1259589713.
4. Applied Cyber Security and the Smart Grid: Implementing Security Controls into the Modern Power Infrastructure (1st Edition), by Eric D. Knapp and Raj Samani.
5. The Art of Invisibility - Kevin Mitnick,2017.

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**

SCSB1461	BLOCKCHAIN DESIGN AND USE CASES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OUTCOMES

- To learn blockchain basics and primitives along with architecture
- To understand how to consensus, work along with design goals.
- To create privacy and security policy and cryptography schemes

UNIT 1 INTRODUCTION TO BLOCKCHAIN

9 Hrs.

Digital Money to Distributed Ledgers, Design Primitives: Protocols, Security, Consensus, Permissions, Privacy. Blockchain Architecture and Design: Basic crypto primitives: Hash, Signature,) Hashchain to Blockchain, Basic consensus mechanisms.

UNIT 2 CONSENSUS

9 Hrs.

Requirements for the consensus protocols, Proof of Work (PoW), Scalability aspects of Blockchain consensus protocols, Permissioned Blockchains: Design goals, Consensus protocols for Permissioned Blockchains.

UNIT 3 HYPERLEDGER FABRIC

9 Hrs.

Hyperledger Fabric (A): Decomposing the consensus process, Hyperledger fabric components, Chaincode Design and Implementation Hyperledger.
Fabric (B): Beyond Chaincode: fabric SDK and Front End (b) Hyperledger composer tool.

UNIT 4 USE CASES 1 AND 2

9 Hrs.

Use case 1: Blockchain in Financial Software and Systems (FSS): (i) Settlements, (ii) KYC, (iii) Capital markets, (iv) Insurance
Use case 2: Blockchain in trade/supply chain: (i) Provenance of goods, visibility, trade/supply chain finance, invoice management discounting, etc

UNIT 5 USE CASE 3

9 Hrs.

Blockchain for Government: (i) Digital identity, land records and other kinds of record keeping between government entities, (ii) public distribution system social welfare systems Blockchain Cryptography, Privacy and Security on Blockchain.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Describe basics of blockchain and hash functions..
- CO2** - Understand the concepts of consensus and protocol.
- CO3** - Define Hyperledger fabric components and design policies.
- CO4** - Design use cases related to trade/supply chain finance.
- CO5** - Ability to design real life situational problems like insurance, KYC, etc.
- CO6** - Apply privacy and security policies and cryptography systems.

TEXT / REFERENCE BOOKS

1. Mstering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos
Blockchain by Melanie Swa, O'Reilly.
2. Hyperledger Fabric - <https://www.hyperledger.org/projects/fabric>.

Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smi.

https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse040_1.html.

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

SCSB1562	ENTERPRISE BLOCKCHAIN PLATFORMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To teach the concepts of block chain technologies.
- To cover the technical aspects of Hyperledger, applications of Ripple and Stellar and the use of Corda and Quorum
- To learn, how these systems work and how to engineer secure software that interacts with the Bit coin network and other crypto currencies.

UNIT 1 INTRODUCTION

9 Hrs.

Block Chain: Architecture – Challenges – Applications – Principles - Ecosystem - Consensus problem – Byzantine fault tolerance agreement: Synchronous and asynchronous - Block chain key protocols: Analysis - Nakamoto consensus on permission – P2P Block chain network - Abstract models for block chain

UNIT 2 HYPERLEDGER

9 Hrs.

Hyperledger - Hyperledger Framework: Public and private ledgers - Hyperledger fabric - Hyperledger sawtooth - Hyperledger Iroha - Hyperledger burrow - Hyperledger Indy. Hyperledger Tools: Hyperledger Caliper - Hyperledger Cello - Hyperledger Composer - Hyperledger Explorer - Hyperledger Quilt.

UNIT 3 RIPPLE AND STELLAR

9Hrs.

Ripple framework - Consensus algorithm - Ledger - Case Study. Stellar framework - Consensus protocol – Ledger - Smart contract - Case Study - Comparison of Ripple and Stellar.

Unit 4 CORDA AND QUORUM

9 Hrs.

Corda framework - Consensus algorithm - Asynchronous Byzantine fault tolerance – Ledger - Case Study. Quorum framework - Consensus protocol - Ledger - Smart contract - Case Study.

UNIT 5 TEZOS AND DRAGONCHAIN

9 Hrs.

Tezos framework - Consensus algorithm - Delegated proof of stake - Ledger-Case Study - Dragon Chain framework-Consensus algorithm- Context-based verification with five levels of consensus – Ledger - Case Study.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand emerging abstract models for blockchain technology.

CO2 - Analyse the concept of hyperledger.

CO3 - Apply the tools for understanding the background of blockchain platforms.

CO4 - Identify major research challenges and technical gaps existing between various blockchain platforms.

CO5 - Understanding of latest advances in blockchain platform.

CO6 - Identify the appropriate blockchain platform for an application

TEXT / REFERENCE BOOKS

1. Melanie Swan, "Block Chain: Blueprint for a New Economy", O'Reilly, first edition –2015.
2. Daniel Drescher, "Block Chain Basics", Apress; 1st edition, 2017
3. Imran Bashir, "Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Packt Publishing, 1st edition –2012.
4. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain", Packt Publishing.
5. <https://developer.ibm.com/patterns/create-and-deploy-block-chain-network-usingfabric-sdk-java/>.
6. <https://www.leewayhertz.com/blockchain-platforms-for-top-blockchain-companies/>.

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**

SCSB3018	PYTHON FOR DATA SCIENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the fundamental and complex data structures in Python.
- To clean, scale and normalize the data sets.
- To develop skill sets that are required to build prediction models and visualize it.

UNIT 1 PYTHON FUNDAMENTALS

9 Hrs.

Basic data types and variables Operators - Complex data structures Control flow - Loops - Functions and methods - Classes - Objects - Modules - Import packages - Documentation.

UNIT 2 PACKAGES FOR DATA SCIENCE

9 Hrs.

NumPy: NumPy Arrays Random array module Data distribution NumPy ufuncs -, Pandas: Pandas series, Pandas dataframe, Read CSV, JSON – Analyze data Pandas correlation.

UNIT 3 DATA PREPROCESSING USING PYTHON

9 Hrs.

Python data operations - Python data cleansing - Python processing CSV data, JSON data, XLS data - Scaling – Normalization - Relational databases - NoSQL Databases - Date and Time - Data wrangling - Data aggregation - Reading HTML pages - Processing unstructured data - Word tokenization - Stemming and lemmatization.

UNIT 4 MODELLING PROCESS USING SCIKIT LEARN

9 Hrs.

Scikitlearn : Splitting the dataset - Train the Model - Model Persistence: Dump and Load Estimator API : Choose a class of model Choose model hyperparameters Arranging the data Model Fitting Applying the model Predict(), Transform() - Refitting and Updating Parameters.

UNIT 5 ANALYSING AND VISUALIZING DATA

9 Hrs.

Data Analysis: Filtering - Cleaning data group by operations - Pivot tables -Data visualization - Plotting with Matplotlib - Bar charts - Scatter plots - Histograms - Customizing visualizations Visualization of normal, binomial, poisson, uniform, logistic, multinomial, exponential, distribution

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, the students will be able to

- CO1 - Appreciate the beauty of various packages.
- CO2 - Implement preprocessing techniques effectively.
- CO3 - Represent data efficiently.
- CO4 - Analyze the data at higher levels.
- CO5 - Build a model using the various functions.
- CO6 - Visualize the model using appropriate packages.

TEXT / REFERENCE BOOKS

1. William Mc Kinney, "Python for Data Analysis", O'Reilly, 2017.
2. Chris Albon, "Machine Learning with Python Cookbook: Practical Solutions from Preprocessing to Deep Learning", O'Reilly, 2017.
3. Al Sweigart, "Automate the Boring Stuff with Python: Practical Programming for Total Beginners", No Starch Press, 2015.
4. https://www.tutorialspoint.com/scikit_learn/index.htm.
5. https://www.tutorialspoint.com/python_data_science/index.htm.

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**

SCSB1451	NEURAL NETWORKS AND DEEP LEARNING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the foundational concepts of neural networks and deep learning.
- To explore various activation functions and loss functions.
- To investigate applications of CNNs and RNNs.

UNIT 1 NEURAL NETWORKS 9 Hrs.

Introduction Artificial Neurons- Neuron structure and functionality - Types of neural networks, Hebbian Learning-Perceptron's-Limitations of Linear nets and perceptron's-Activation Functions-Error Function- Loss Function-Neural Network Architectures Single Layer-Multi Layer-Deep Networks.

UNIT 2 SUPERVISED AND UNSUPERVISED NETWORKS 9 Hrs.

Supervised Learning Networks - Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks. Unsupervised Learning Network - Fixed Weight Competitive Nets - Maxnet - Hamming Network, Kohonen Self-Organizing Feature Maps - Adaptive Resonance Theory Networks.

UNIT 3 CNN AND RNN 9 Hrs.

CNN: Introduction-Convolution and Pooling Layers-CNN Architectures (LeNet, AlexNet, VGG, ResNet)- Object Detection and Localization with CNNs-Image Classification and Transfer Learning-Case Studies: Image Recognition and Analysis

RNN: Introduction- Vanishing and Exploding Gradients - LSTM (Long Short-Term Memory) Networks-GRU (Gated Recurrent Unit) Networks-Applications of RNNs: Sequence Prediction - Language Modeling and Text Generation -Time Series Analysis and Forecasting.

UNIT 4 DEEP LEARNING 9 Hrs.

Introduction to Deep Learning - Historical Trends in Deep learning - Autoencoders and Dimensionality Reduction - Generative Adversarial Networks (GANs) - Reinforcement Learning and Deep Q-Networks (DQN)-Attention Mechanisms and Transformer Networks-Transfer Learning.

UNIT 5 CASE STUDY 9 Hrs.

Implementing Neural Networks and Deep Learning Models using Frameworks like TensorFlow or PyTorch, Case Studies: Image Recognition and Analysis- Object Recognition in Video Streams-Sequence Prediction- Sentiment Analysis- Text Classification - Named Entity Recognition (using NLTK Library).

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1** - Understand the concepts of Neural Networks
- CO2** - Differentiate supervised and unsupervised learning networks.
- CO3** - Implement SOM and ART Algorithms.
- CO4** - Differentiate various types of neural networks, feedforward, convolutional, recurrent, and deep networks
- CO5** - Implement neural networks and deep learning models using various frameworks
- CO6** - Choose appropriate neural network architectures and techniques for specific applications.

TEXT / REFERENCE BOOKS

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning: An MIT Press Book , " Alanna Maldonado Publishing, 2016.
2. Charu Aggarwal, "Neural Networks and Deep Learning", Springer International Publishing, 2023.
3. Charu Aggarwal, "Neural Networks and Learning Machines", Simon Haykin, 3rd Edition, Pearson Prentice Hall, 2009.
4. Rajalingappaa Shanmugamani, "Deep Learning for Computer Vision, Expert Techniques to Train Advanced Neural Networks using TensorFlow and Keras", Packt Publishing, 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 Marks
PART B :	2 questions from each unit of internal choice; each carrying 16 marks	80 Marks

SCSB3020	SOCIAL NETWORK ANALYSIS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To illustrate basic principles behind network analysis algorithms.
- To introduce to computational study of people's opinions, sentiments, emotions, moods, and attitudes.
- To solve problems such as emotion detection and opinion mining.

UNIT 1 INTRODUCTION TO SOCIAL NETWORKS 9 Hrs.

Types of social networks: General random networks - Small world networks - Scale-free networks - Examples of information networks - Network centrality measures - Strong and weak ties – Homophily - groups - Subgroups and Cliques, Clustering, block models, dyads and individuals - Ego networks – Reciprocity - Social capital - Structural holes - Equivalence.

UNIT 2 STRUCTURES, MODELS AND PROCESSES OF A SOCIAL NETWORK 9 Hrs.

Models and simulation of network evolution - Diffusion in networks, Contagion in networks - Complex contagion - Percolation and information - Navigation in networks revisited - Small world experiments - small world models -Origins of small world - Heavy tails, Small diameter - Clustering of connectivity - The Erdos Renyi Model - Clustering models.

UNIT 3 NETWORKS AND LANGUAGE 9 Hrs.

Introduction: Integration of text and network analysis - Types of networks extracted from texts across disciplines - Natural language processing and linguistics for information and relation extraction - link prediction - Feature based link prediction - Event Detection: Classification of text streams - Event detection and tracking: Bag of words - Temporal, location, ontology based algorithms - Evolution analysis in text streams.

UNIT 4 SENTIMENT AND EMOTION DETECTION 9 Hrs.

Introduction - Sentiment analysis applications - Sentiment analysis research -Sentiment analysis as mini-NLP - Sentiment classification and clustering - Document sentiment classification - Supervised sentiment classification - Unsupervised sentiment classification - Sentiment rating prediction - Temporal sentiment analysis - Differences between sentiment analysis and emotion detection.

UNIT 5 SOCIAL INFLUENCE ANALYSIS AND OPINION ANALYSIS 9 Hrs.

Influence measures - Social similarity - Measuring influence - Influencing actions and interactions - Influence maximization - Definition of opinion - Definition of opinion summary - Different types of opinions - Opinion extraction - Irony detection in opinion mining.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, the students should be able to:

- CO1** - Comprehend different types of social networks.
- CO2** - Design the structure of a social network.
- CO3** - Analyse real world networks.
- CO4** - Build the model for sentimental analysis.
- CO5** - Mine the interest of the user using NLP techniques.
- CO6** - Discover interesting patterns for opinion analysis.

TEXT / REFERENCE BOOKS

1. Federico Pozzi, Elisabetta Fersini, Enza Messina, "Sentiment Analysis in Social Networks Bing Liü, 2016.
2. David Easley and Jon Kleinberg, "Networks, Crowds and Markets Cambridge University Press, 2010.
3. Freeman, Linton C., "The Development of Social Network Analysis: A Study in the Sociology of Science", Empirical Press, 2004.
4. Matthew O. Jackson, "Social and Economic Networks", Princeton University Press, 2010.

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**

SCSB3021	ARTIFICIAL INTERNET OF THINGS (AIoT)	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To get in-depth knowledge of the AIoT technology in emerging computing.
- To apply Artificial Intelligence to the data and makes it possible to get the most out of them and make sense of all this information.
- To get intelligent solutions for cities, industry, the health and transportation sectors, among others.

UNIT 1 INTRODUCTION TO AIoT

9 Hrs.

AIoT (Artificial Intelligence of Things) - From AI and IoT to AIoT - AI capable IoT platforms - Understand the basic concepts of AIoT - Applications and examples of AIoT - Benefits and challenges of AIoT - Future of AIoT - Importance of AIoT - Potential uses of AIoT.

UNIT 2 AIoT FOR SMART ENVIRONMENTS

9 Hrs.

Components in smart environment - Data pre-processing - Data processing - Sensors - Environment control (actuators) - Sensors for homes - Wireless sensor networks - Home-based sensor platform - Sensor technologies - Smart monitoring and controlling - Challenges.

UNIT 3 APPLICATION ORIENTED SMART CITIES BASED ON AIoT

9 Hrs.

Introduction - Smart cities overview and AIoT - The framework deployment and architecture of Smart City - AIoT-powered Smart City transformation - Functions and features of Smart Cities - Instruments that aid in the creation of a Smart City - AIoT and challenges in building Smart City

UNIT 4 AIoT BASED WASTE MANAGEMENT SYSTEMS

9 Hrs.

Various types and techniques for waste disposal - IoT-based waste management system - Main features of AIoT-based framework for waste management - Data and proposed methodology - Design model - Waste collection model - Working of intelligent bin process - Intelligent bin control by using AI.

UNIT 5 AIoT TECHNOLOGIES, APPLICATIONS AND FUTURE PERSPECTIVES

9 Hrs.

IoT in smart manufacturing system - Challenges for smart manufacturing - Challenges in the area of IoT and Big Data analytics - Challenges in the area of IoT and blockchain computing - Security issues and challenges
- The concept of blockchain technology - The applications of blockchain technology utilized in the current period - Potential challenges in AIoT technology - Future perspectives and research directions.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, the students would be able to:

- CO1** - Remember the basic concepts of AI and IoT technologies to get the idea about AIoT.
- CO2** - Understand the concept of analysing the data by using AI-integrated IoT devices to reveal patterns and insights.
- CO3** - Analyse continually to get improved decisions from the data collected by the devices used for smart cities.
- CO4** - Implement the AI-integrated IoT waste management devices to analyse data to reveal patterns and insights and adjust system operations to become more efficient.
- CO5** - Recognize the smart connected network of devices that seamlessly communicate over powerful networks unleashing the power of data better and faster than ever.
- CO6** - Construct a Real-time monitoring systems to save time, to reduce expensive business interruptions and It involves constant supervision by the system to detect anomalies and make predictions or make decisions based on the same.

TEXT / REFERENCE BOOKS

1. Dirk Slama, Tanja Rückert, Sebastian Thrun, Ulrich Homann, Heiner Lasi eds, "The Digital Playbook: A Practitioner's Guide to Smart, Connected Products and Solutions with AIoT", Springer Nature Switzerland AG, 1st ed. 2023.
2. Ajantha Devi, Anand Nayyar, Fadi Al-Turjman, Piyush Kumar Shukla, Intelligence of Things: AI-IoT Based Critical-Applications and Innovations (AIoT Innovation) , Springer Nature, 1st edition, 2021.
3. Chenshu Wu, Kun Qian, Yi Zhang, Zheng Yang, Smart Wireless Sensing: From IoT to AIoT " , 2021, Springer Verlag, 1st edition, 2021.
4. Chander Prakash, Lakhwinder Pal Singh, Ajay Gupta, Role of AIoT-based intelligent automation in robotics, UAVs, and drones, ebook-Source: AIoT Technologies and Applications for Smart Environments", IET Digital Library 2022.

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**

SCSB3022	PROBABILISTIC GRAPHICAL MODELS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To solve problems using graphical models and inference algorithms.
- To learn the structure of the graphical model from data.
- To develop the knowledge and skills required for design, implement and apply these models to solve real problems.

UNIT 1 INTRODUCTION

9 Hrs.

Fundamentals of Probability Theory - Overview of graphs - Probabilistic graphical models with examples - Probability theory - Probability distributions - Random variables and joint distributions - Independence and conditional independence - Graphs - The Bayesian network representation (Directed Models) - The Naive Bayes Model (Conditional Independence) - Independencies in graphs - Bayesian implementation using Python.

UNIT 2 REPRESENTATION

9 Hrs.

Undirected Graphical Models - Parameterization - Markov network independencies - Bayesian networks and Markov networks - Partially directed models - Local probabilistic models - Template-Based representations - Gaussian network models - Construct Markov model using Python.

UNIT 3 INFERENCE

9 Hrs.

Exact Inference: Variable elimination - Complexity and graph structure: Variable elimination - Conditioning - Clique trees - Message passing: Sum product and belief propagation (Sum Product) - Constructing a clique tree - Inference as optimization - Particle-based approximate inference - MAP inference - Sampling based inference, Variational inference.

UNIT 4 LEARNING

9 Hrs.

Learning graphical models - Goals - Learning as optimization - Parameter estimation - MLE for Bayesian networks - Bayesian parameter estimation in Bayesian networks - Learning models with shared parameters - Generalization analysis - Structure learning in Bayesian networks - Structure Scores and search - Bayesian model averaging - Partially observed data - Approximate inference - Bayesian learning with incomplete data - Learning structure using pgmpy.

UNIT 5 ACTIONS AND DECISIONS

9 Hrs.

Causal Models - Mechanisms and response variables - Partial identifiability in functional causal models - Counterfactual queries - Learning causal models - Utilities and decisions - Utility curves - Utility elicitation - Preference and utility independence - Decision trees - Influence diagrams - Backward induction in influence Diagrams - Generalized variable elimination - Strategic relevance and global optimality - Ignoring irrelevant information - Case Study: Multinomial HMM implementation in Python.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, the students should be able to

- CO1** - Comprehend the joint distributions and conditional independence.
- CO2** - Understand the mathematical framework of probabilistic graphical models.
- CO3** - Analyze the basic algorithms for probabilistic inference in graphical models.
- CO4** - Implement the algorithms for learning graphical models.
- CO5** - Recognize and apply Bayesian principles behind modeling domain knowledge under uncertainty.
- CO6** - Construct new methodologies for stating various statistical and causal models.

TEXT / REFERENCE BOOKS

1. Koller, D. and Friedman, N. "Probabilistic Graphical Models: Principles and Techniques", MIT Press, 2009.
2. Jensen, F. V. and Nielsen, T. D., "Bayesian Networks and Decision Graphs. Information Science and Statistics" Springer, 2nd edition, 2002.
3. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective 4th Printing. MIT Press, 2013.
4. Barber, D. "Bayesian Reasoning and Machine Learning Cambridge University Press, 1st edition, 2011.
5. Bishop, C. M. "Pattern Recognition and Machine Learning (Information Science and Statistics)", Springer, 2nd printing, 2011.
6. Wainwright, M. and Jordan, M., "Graphical Models, Exponential Families, and Variational Inference. Foundations and Trends in Machine Learning", 2008.

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**

SCSB3023	DATA VISUALIZATION TECHNIQUES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To develop skills to both design and critique visualizations.
- To introduce visual perception and core skills for visual analysis.
- To understand visualization for correlation analysis and multivariate analysis.

UNIT 1 INTRODUCTION TO DATA VISUALIZATION

9 Hrs.

Value of Visualization – What is visualization and why do it: visual perception - External representation – Interactivity – Difficulty in Validation Effective data analysis – Traits of meaningful data – Visual perception – Making abstract data visible – Building blocks of information visualization – Analytical interaction – Analytical navigation – Optimal quantitative scales – Reference lines and regions – Trellises and crosstabs – Multiple concurrent views – Focus and context – Details on demand – Over-plotting reduction – Analytical patterns – Pattern examples.

UNIT 2 TIME-SERIES, RANKING, AND DEVIATION ANALYSIS

9 Hrs.

Time-series analysis – Time-series patterns – Time-series displays – Time-series best practices – Part- to-whole and ranking patterns – Part-to-whole and ranking displays – Best practices – Deviation analysis – Deviation analysis displays – Deviation analysis best practices.

UNIT 3 DISTRIBUTION, CORRELATION, AND MULTIVARIATE ANALYSIS

9 Hrs.

Distribution analysis – Describing distributions – Distribution patterns – Distribution displays – Distribution analysis best practices – Correlation analysis – Describing correlations – Correlation patterns – Correlation displays – Correlation analysis techniques and best practices – Multivariate analysis – Multivariate patterns – Multivariate displays – Multivariate analysis techniques and best practices.

UNIT 4 EXPLORATORY VISUALIZATION USING TABLEAU AND POWERBI

9 Hrs.

Introduction to Tableau – Creating visualizations with Tableau - Sorting, Top N, bottom N-Filtering- Mapping Editing, Building, and Formatting Views.
Introduction to PowerBI – Connecting to data using power query – Joining and Editing Data – Building visualization using power query- Adding interactivity to power view reports.

UNIT 5 INFORMATION DASHBOARD DESIGN

9 Hrs.

Introduction – Dashboard design principles – Dashboard design issues and assessment of needs – Building dashboards – Formatting dashboards – Adding interactivity to dashboards – Building stories. Canvas selection – Tiled object – Floating object – Pixel perfect alignment – Summary box – Chart titles and captions – Adding image and text – Adding shading – Adding separator lines – Dynamic chart title – Information icons - Creating a story.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, the students should be able to

CO1 - Explain principles of visual perception.

CO2 - Apply core skills for visual analysis.

CO3 - Apply visualization techniques for various data analysis tasks.

CO4 - Design information dashboard.

CO5 - Prepare data for visualization.

CO6 - Demonstrate skills on creating visual representation of Data.

TEXT / REFERENCE BOOKS

1. Ben Fry, "Visualizing data: Exploring and Explaining Data with the Processing Environment", O'Reilly, 2008.
2. Edward R. Tufte, "The Visual Display of Quantitative Information", Second Edition, Graphics Press, 2001.
3. Evan Stubbs, "The Value of Business Analytics: Identifying the Path to Profitability", Wiley, 2011.
4. Gert H. N. Laursen and Jesper Thorlund, "Business Analytics for Managers: Taking business intelligence beyond reporting", Wiley, 2010.
5. Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.
6. Stephen Few, "Information dashboard design: Displaying data for at-a-glance monitoring", second edition, Analytics Press, 2013.
7. Stephen Few, "Now you see it: Simple Visualization techniques for quantitative analysis", Analytics Press, 2009.
8. Tamara Munzner, Visualization Analysis and Design, AK Peters Visualization Series, CRC Press, Nov. 2014.

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

SCSB3024	NATURAL LANGUAGE PROCESSING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn the fundamentals of natural processing.
- To understand the way to measure one or more qualities of an algorithm or a system.
- To gain knowledge of the linguistics concerned with the interactions between computers and human.

UNIT 1 OVERVIEW AND LANGUAGE MODELLING 9 Hrs.

Overview: Origins and challenges of NLP - Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions - Finite-State Automata – English morphology - Transducers for lexicon and rules, Tokenization - Detecting and correcting spelling errors, Minimum edit distance.

UNIT 2 WORD LEVEL AND SYNTACTIC ANALYSIS 9Hrs.

Unsmoothed N-grams - Evaluating N-grams Smoothing - Interpolation and Backoff Word Classes - Parts-of-speech tagging - Rule-based, Stochastic and Transformation - based tagging - Issues in PoS tagging Hidden Markov and Maximum Entropy models.

UNIT 3 SYNTACTIC AND SEMANTIC ANALYSIS 9 Hrs.

Context-Free Grammars - Grammar rules for English – Treebanks - Normal forms for grammar – Dependency grammar – Syntactic parsing – Ambiguity - Dynamic programming parsing – Shallow parsing – Probabilistic CFG - Probabilistic CYK - Probabilistic lexicalized CFGs – Feature structures - Unification of feature structures.

Semantic Analysis - Requirements for representation - Lexical semantics and word-sense disambiguation - Compositional semantics - Semantic role labeling and semantic parsing.

UNIT 4 INFORMATION RETRIEVAL AND LEXICAL RESOURCES 9 Hrs.

Information Retrieval: Design features of Information Retrieval Systems - Classical, Non classical - Alternative models of information retrieval–Valuation lexical resources: World Net-Frame Net-Stemmers-POS Tagger- Research Corpora.

UNIT 5 DISCOURSE ANALYSIS AND LEXICAL RESOURCES 9 Hrs.

Discourse segmentation - Coherence-Reference Phenomena - Anaphora resolution using Hobbs and Centering algorithm –Coreference resolution Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brills Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Understand NLP problems and survey the literature about that problem.
- CO2** - Understand language modeling.
- CO3** - Describe automated natural language generation and machine translation.
- CO4** - Learn the natural language generation.
- CO5** - Analyse the logic and semantics of world knowledge.
- CO6** - Analyse and compare the use of different statistical approaches for different types of NLP applications.

TEXT / REFERENCE BOOKS

1. Richard M Reese, "Natural Language Processing with Java ," O'Reilly Media, 2015.
2. Nitin Indurkha and Fred J. Damerau, "Handbook of Natural Language Processing , 2nd Edition, Chapman and Hall, CRC Press, 2010.

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**

SCSB1612	PREDICTIVE AND ADVANCED ANALYTICS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn the concepts and applications of data mining.
- To explore the automated models for categorical and continuous targets.
- To analyse the performance in different models.

UNIT 1 INTRODUCTION TO DATA MINING 9 Hrs.

Introduction to Data Mining - Concepts of data mining - Technologies used - Data mining process, KDD process model, CRISP – DM - Mining on various kinds of data - Applications of data mining -Challenges of data mining.

UNIT 2 DATA UNDERSTANDING AND PREPARATION 9 Hrs.

Introduction - Reading data from various sources - Data visualization - Distributions and summary statistics - Relationships among variables - Extent of missing data - Segmentation - Outlier detection, Automated data preparation - Combining data files - Aggregate data - Duplicate removal - Sampling data - Data Caching - Partitioning data - Missing values.

UNIT 3 MODEL DEVELOPMENT AND TECHNIQUES 9 Hrs.

Data partitioning - Model selection - Model development techniques - Neural networks - Decision trees - Logistic regression - Discriminant analysis - Support vector machine - Bayesian networks - Linear regression - Cox regression - Association rules.

UNIT 4 MODEL EVALUATION AND DEPLOYMENT 9 Hrs.

Introduction - Model validation - Rule induction using CHAID - Automating models for categorical and continuous targets - Comparing and combining models - Evaluation charts for model comparison - Meta level modeling.

UNIT 5 DEPLOYING MODEL 9 Hrs.

Assessing model performance - Updating a model – Bias – Variance and model complexity - Bias-variance trade off - Optimism of the training error rate - Estimate of In-sample prediction error.

Max.45Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1** - Understand the process of formulating business objectives, data selection/collection.
- CO2** - Successfully design, build, evaluate models.
- CO3** - Implement predictive models for various business applications.
- CO4** - Compare the underlying predictive modeling techniques.
- CO5** - Select appropriate predictive modeling approaches to identify cases to progress with.
- CO6** - Deploy model and assess the performance.

TEXT / REFERENCE BOOKS

1. Larose, Daniel T., "Data Mining and Predictive Analytics", Wiley, 2015.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning-Data Mining, Inference, and Prediction", Second Edition, Springer Verlag, 2009.
3. C.M.Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
4. Wasserman, Larry, "All of Statistics: A Concise Course in Statistical Inference.", Ukraine, Springer New York, 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**

SCSB3026	APPLICATIONS OF MACHINE LEARNING IN INDUSTRIES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To determine the factors involved in decision support that can improve business performance across the provider / payer ecosystem.
- To identify opportunities for business applications in healthcare by applying journey mapping and pain point analysis in a real world context.
- To identify differences in methods and techniques in order to appropriately apply to pain points using case studies.

UNIT 1 ADVANCED MACHINE LEARNING

9 Hrs.

Deep learning for customer services - Chatbot: Deep learning approach, AI powered marketing systems - Deep learning in cyber security - Types of cyber-attacks in banks - Deep learning methods used in cyber security - Deep learning v/s restricted Boltzmann machines - Convolution Neural Networks (CNNs) - Recurrent neural networks - Machine learning techniques: Loan underwriting and sentiment/news analysis - Sentiment or news analysis - Current challenges and opportunities: Banking and security domain.

UNIT 2 MACHINE LEARNING IN BANKING AND SECURITIES

9 Hrs.

Role of machine learning in banking sector - Use of AI in banking and finance - Fraud detection - Customer data management - Personalized marketing - Challenges of banking sector and securities - Widely used machine learning algorithms in banking and security - Fraud prevention and detection systems - Rule based and machine learning based approach in fraud detection - Anomaly detection: Ways to expose suspicious transactions in banks - Advanced fraud detection systems - Risk management systems. Case study: Application of machine learning for financial risk management - Credit risk analysis using machine learning classifier - Investment prediction systems.

UNIT 3 MACHINE LEARNING IN HEALTHCARE AND LIFE SCIENCES

9 Hrs.

Applications of machine learning in health and life sciences - Role of machine learning in drug discovery - Medical image analysis - Why deep learning for medical image analysis - Neural network and deep learning architecture - Comparisons between architecture of different types of deep learning models - Machine learning in genetics and genomics - Genomics and AI background - Interpreting deep learning models - Predictive medicine: Prognosis and diagnostics accuracy - Predictive medicine: Examples - ML applications in breast cancer diagnosis and prognosis.

UNIT 4 MACHINE LEARNING IN EDUCATION

9 Hrs.

Advantages of machine learning in education, learning analytics, Academic analytics, Action research, Educational data mining, Recommender system, Personalized adaptive learning, Learning analytics process Case study: Sentimental analysis for student's feedback using ML, Recommender systems in education, Domain model, Learner model, Students classification algorithm, Recommendation model, Case study: Application of ML in predicting students' performance. Proposed Data description, Sample data sets, Visualization, Selection of machine learning technique.

UNIT 5 MACHINE LEARNING IN MEDIA AND COMMUNICATION

9 Hrs.

Machine learning in communication - media and entertainment - Usage of machine learning in media and entertainment industry - Machine learning techniques for customer sentiment analysis - World embedding's - Sentiment analysis with long short term memory networks - Real-time analytics in communication -

media and entertainment industries - Real time analytics and social media - Deep learning for social media analytics

- Recommendations engines - Collaborative filtering - Memory based collaborative filtering - Model based collaborative filtering - Content based filtering - Hybrid recommendation systems - Summary of recommendation systems - Deep learning techniques on recommender systems.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Comprehend advanced concepts of machine learning and deep learning.

CO2 - Analyze concepts of machine learning on banking domain.

CO3 - Apply concepts of Machine Learning in Healthcare sectors.

CO4 - Appreciate the various applications in Education sectors.

CO5 - Identify the applications in Media and Communication Sectors.

CO6 - Recognize and apply various machine learning concepts on case studies from different business sectors.

TEXT / REFERENCE BOOKS

1. "Building Cognitive Applications with IBM Watson Services: Volume 1 Getting Started", N.p., IBM Redbooks, 2017.
2. "Machine Learning Algorithms for Industrial Applications, Studies in Computational Intelligence", Springer Book series, 2021.
3. Pedro Larrañaga, David Atienza, Javier Diaz-Rozo, Alberto Ogbechie, Carlos Esteban Puerto-Santana, Concha Bielza, "Industrial Applications of Machine Learning", CRC press, 1st edition, 2020.
4. Goodfellow, Ian., Bengio, Yoshua., Courville, Aaron. Deep Learning. United Kingdom: MIT Press, 2016. Trevor Hastie, Robert Tibshirani, and Jerome Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction", Springer series in statistics, 2nd edition, 2019.
5. Drew Conway and John Myles White, "Machine Learning for Hackers: Case Studies and Algorithms to Get you Started", First Edition, O'Reilly Media, 2020.
6. John D. Kelleher, Brian Mac Namee, and Aoife D'Arcy, 13. Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies, MIT press, 1st edition, 2020.

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

SCSB3027	DATA SCIENCE AND SOCIETY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the mathematical foundations required for data science.
- To provide solutions to societal challenges and gain knowledge on legal and ethical issues related to data science.
- To learn machine tools and techniques and interpret data using visualization libraries in Python.

UNIT 1 DESCRIBING RELATIONSHIPS

9 Hrs.

Correlation Scatter plots correlation coefficient for quantitative data computational formula for correlation coefficient Regression regression line least squares regression line Standard error of estimate interpretation of r^2 multiple regression equations regression towards the mean.

UNIT 2 INTRODUCTION TO DATA SCIENCE

9 Hrs.

Data Science: Importance, Benefits, uses and applications-Scope of Data Science- Data Science with other fields - facets of data - Types of Data - Types of Variables -Describing Data with Tables and Graphs Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores- Data Science Process: Overview - Defining research goals Retrieving data Data preparation - Exploratory Data analysis build the model presenting findings and building applications - Data Mining - Data Warehousing Basic Statistical descriptions of Data.

UNIT 3 DATA SCIENCE AND SOCIETY

9 Hrs.

Data Science for Social Good, Importance and Benefits of Data Science in Society, Business value of Data Science, Data Types Used to Improve Public Health and Welfare, Solutions for societal challenges, Private Law and data science, Legal and ethical issues related to data science. Intellectual Property Rights, Data Science: Privacy, Security, and Protection.

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 DATA CLEANING, PREPARATION AND VISUALIZATION

9 Hrs.

Data Cleaning and Preparation: Handling Missing Data - Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Detecting and Filtering Outliers-String Manipulation: Vectorized String Functions in pandas.
Data Visualization - Basic principles, ideas and tools for data visualization- Need for Visualization-Plotting with pandas: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn- Examples of exciting projects- Case studies.

Max 45 Hrs.

COURSE OUTCOMES

On completion of the course the 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 machine learning algorithms to solve real-world problems.
- CO4 - Analyze the performance of parameters that can be achieved by applying different models.
- CO5 - Apply visualization Libraries in Python to interpret and explore data
- CO6 - Apply the python libraries used for data analysis.

TEXT / REFERENCE BOOKS

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (Unit I).
2. Gilbert Strang, "Introduction to Linear Algebra ", Wellesley -Cambridge Press, 5th
3. Douglas Montgomery , "Applied Statistics Probability For Engineers", 10th Edition. 2016.
4. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, 2016.
5. Jake Vander Plas, "Python Data Science Handbook", O'Reilly, 2016.
6. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014
7. Avrim Blum, John Hopcroft and Ravindran Kannan, "Foundations of Data Science", Cambridge University Press, 2020.
8. Anne Beaulieu, Sabina Leonelli , "Data and Society, A Critical Introduction", Sage Publishing 2021.

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**

SCSB3028	MATHEMATICAL TOOLS FOR DATA	L	T	P	EL	Credits	Total Marks
	SCIENCE	3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the mathematical foundations required for data science.
- To provide a comprehensive calculus background required to solve standard Data Science problems.
- To identify and implement standard solutions to generic problems of optimization and integration encountered in data science.

UNIT 1 LINEAR ALGEBRA

9 Hrs.

Linear Algebra: Vector and matrices → vectors 2D, 3D and ND-matrices - Systems of linear equations- Null Space- Rank- Eigen values and Eigen vectors, Singular value decomposition - Matrix operations: addition, multiplication, transpose, inverse - Principal component analysis (PCA).

UNIT 2 PROBABILITY AND STATISTICS

9 Hrs.

Basic probability- conditional probability- Bayes' rule - Application to web search algorithms: Link analysis and Page rank - Descriptive statistics- Covariance and covariance matrix- Normal distribution- probability density function - Hypothesis testing - Differentiation and integration - Optimization techniques (gradient descent, Newton's method) - Multivariable calculus - Partial derivatives - Probability and statistics: - Probability theory and distributions - Bayesian statistics.

UNIT 3 FOUNDATIONS OF STATISTICAL LEARNING

9 Hrs.

Basics of statistical learning: Models - Regression- Curse of dimensionality - Overfitting- Optimization and convexity - Gradient descent - Newton's method.

UNIT 4 CLASSIFICATION AND CLUSTERING

9 Hrs.

Linear discriminant analysis - Logistic regression - Support vector machines (SVM)- Similarity and distances- Nearest neighbour methods - Decision trees and application of entropy- Clustering algorithm.

UNIT 5 OPTIMIZATION AND INFORMATION THEORY

9 Hrs.

Linear programming - Nonlinear programming - Convex optimization - Entropy - Mutual information - Compression algorithms - Numerical Methods - Root finding algorithms - Interpolation and extrapolation
- Numerical integration.

Max 45 Hrs.

COURSE OUTCOMES

On completion of the course, the student will be able to

- CO1 - Explain the rationale behind second order conditions to optimize smooth multivariate functions in the constrained and unconstrained scenarios.
- CO2 - Describe, choose and apply numerical methods to optimize smooth and rough functions.
- CO3 - Apply essential calculus concepts relevant to data science.
- CO4 - Apply and use both analytical and numerical methods for integration .
- CO5 - Implement some of these techniques in one of the standard programming languages.
- CO6 - Analyze and correlate the results to the solutions.

TEXT / REFERENCE BOOKS

1. Deisenroth, Marc Peter., Faisal, A. Aldo., Ong, Cheng Soon, "Mathematics for Machine Learning", Cambridge University Press, 2020.
2. Goodfellow, I., Bengio, Y., Courville, A., "Deep Learning", MIT Press, 2016.
3. Bishop, Christopher M., "Pattern Recognition and Machine Learning", Springer New York, 2006.
4. Lay, David C, Lay, Steven R., McDonald, Judi., "Linear Algebra and Its Applications", Global Edition, Pearson Education, 2021.
5. Blitzstein, Joseph K., Hwang, Jessica, "Introduction to Probability", Second Edition. CRC, Press, 2019.
6. Press, William H., "Numerical Recipes: The Art of Scientific Computing", Cambridge University Press, 3rd Edition, 2007.
7. Boyd, Stephen P, Vandenberghe, Lieven, "Convex Optimization", Cambridge University Press, 2004.
8. Strang, Gilbert, "Introduction to Linear Algebra", Wellesley, 2016.

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**

SCSB3029	MACHINE LEARNING FOR DATA SCIENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To impart knowledge of machine learning techniques for data handling.
- To develop skills of using recent machine learning software for solving practical problems.
- To describe a flow process for data science problems and tools for data visualization.

UNIT 1 INTRODUCTION TO MACHINE LEARNING 9 Hrs.

Introduction - Examples of various Learning Paradigms - Perspectives and Issues - Version Spaces - Finite and Infinite Hypothesis Spaces - PAC Learning - VC Dimension.

UNIT 2 SUPERVISED LEARNING ALGORITHMS 9 Hrs.

Learning a class from examples-Linear, Non-linear, Multi-class and Multi-label classification - Decision Trees: ID3 - Classification and Regression Trees (CART) - Regression: Linear Regression - Multiple Linear Regression - Logistic Regression - Neural Networks: Introduction - Perceptron - Multilayer Perceptron - Support vector machines: Linear and nonlinear kernel functions & Nearest Neighbors.

UNIT 3 UNSUPERVISED LEARNING 9 Hrs.

Introduction to clustering - Hierarchical: AGNES - DIANA - Partitional: K-means clustering - K-Mode clustering - Self-organizing map - Expectation maximization - Gaussian mixture models - Principal Component Analysis (PCA) - Locally Linear Embedding (LLE) - Factor analysis.

UNIT 4 EXPLORATORY DATA ANALYSIS AND THE DATA SCIENCE PROCESS 9 Hrs.

Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - Data science process - Data visualization - Basic principles, ideas and tools for data visualization - Examples of exciting projects - Data Visualization using Tableau.

UNIT 5 INTRODUCTION TO PYTHON 9 Hrs.

Data structures-Functions Numpy Matplotlib Pandas - Series and Data frame - Manipulating data frames - Extracting information - Plotting - Scikit-learn - Partitioning the data - Standardization- Fitting and prediction- Testing the model.

Max 45 Hrs.

COURSE OUTCOMES

On completion of the course, the student will be able to

- CO1** - Understand complexity of machine learning algorithms and their limitations.
- CO2** - Apply various supervised learning methods to appropriate problems.
- CO3** - Apply common machine learning algorithms in practice and implement their own.
- CO4** - Create probabilistic and unsupervised learning models for handling unknown patterns.
- CO5** - Describe the data science process and how its components interact.
- CO6** - Simulate data visualization in exciting projects.

TEXT / REFERENCE BOOKS

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014.
2. Cathy O'Neil, Rachel Schutt, "Doing Data Science, Straight Talk From The Frontline", O'Reilly, 2014.
3. D.P. Kroese, Z.I. Botev, T. Taimre, R. Vaisman, "Data Science and Machine Learning: Mathematical and Statistical Methods", CRC, 2019.
4. Avrim Blum, John Hopcroft and Ravindran Kannan, "Foundations of Data Science", Cambridge University Press, 2020.
5. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.

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**

SCSB3030	PROGRAMMING IN R	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the basic fundamentals of R language.
- To fit some basic types of statistical models.
- To appreciate and apply the R programming from a statistical perspective.

UNIT 1 INTRODUCTION TO R

9 Hrs.

Introduction - History and overview of R - elements and data structures - Sessions and Functions - Variables - Data Types - Vectors - Scalars - Conclusion - Data Frames - Lists - Matrices - Arrays - Classes - Data input/output - Data storage formats - Subsetting objects - Vectorization.

UNIT 2 MATRICES, ARRAYS AND LISTS

9 Hrs.

Matrices, Arrays and Lists - Creating matrices - Matrix operations - Applying Functions to Matrix Rows and Columns - Adding and deleting rows and columns - Vector/Matrix Distinction - Avoiding Dimension Reduction - Higher Dimensional arrays - lists - Creating lists - General list operations - Accessing list components and values - applying functions to lists - recursive lists.

UNIT 3 DATA MANIPULATION

9 Hrs.

Math and Simulation in R, Functions, Math Function, Probability Calculation - Cumulative Sums and Products - Minima and Maxima - Data sorting - Linear Algebra Operation on Vectors and Matrices - Set Operation.

UNIT 4 CONTROL STATEMENTS, FUNCTIONS, R GRAPHS

9 Hrs.

Control statements - Arithmetic and Boolean operators and values - Default values for arguments - Returning Boolean values - functions are objects - Environment and Scope issues - Writing Upstairs - Recursion - Replacement functions - Tools for composing function code - Math and Simulations in R - Creating Graphs - Customizing Graphs - Saving graphs to files - Creating three-dimensional plots.

UNIT 5 INTERFACING

9 Hrs.

Interfacing R to other languages - Parallel R - Basic Statistics - Linear Model - Generalized Linear models - Non-linear models - Time Series and Auto-correlation Clustering.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - State the capabilities of R and its data, variable types.
- CO2 - Describe various operators, control statements and scoping rules in R.
- CO3 - Apply R programming for manipulation of datasets.
- CO4 - Analyse data using real time examples.
- CO5 - Produce various graphs and distribution plots using R.
- CO6 - Develop interfacing R to other languages.

TEXT / REFERENCE BOOKS

1. Chris Brunsdon, Lex Comber, An Introduction to R for Spatial Analysis and Mapping, 2nd Revised Edition, Sage Publications Ltd (UK), 2019.
2. Norman Matloff, "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press, 2011.
3. Mark Gardener, Beginning R -The Statistical Programming Language, John Wiley and Sons, Inc., 2012.
4. Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics", Addison-Wesley Data and Analytics Series, 2013.
5. Robert I. Kabacoff, "Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R", Amazon Digital South Asia Services Inc, 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**

SCSB1712	COMPUTER VISION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To discuss the different algorithms for 3D reconstruction and recognition.
- To emphasize the core vision tasks of scene understanding and recognition.
- To discuss the applications to 3D modeling, video analysis, and video surveillance, object recognition and vision based control.

UNIT 1 INTRODUCTION

9 Hrs.

Image Processing - Computer vision and computer graphics - What is computer vision - Low-level, Mid-level, High-level - Overview of diverse computer vision applications: Document image analysis - Biometrics - Object recognition - Tracking - Medical image analysis - Content-based image retrieval - Video data processing - Multimedia - Virtual reality and augmented reality.

UNIT 2 IMAGE FORMATION MODELS

9 Hrs.

Monocular imaging system - Radiosity: The 'Physics' of image formation - Radiance, Irradiance, BRDF, color etc. - Orthographic and perspective projection - Camera model and camera calibration - Binocular imaging systems - Multiple views geometry - Structure determination - Shape from shading - Photometric Stereo - Depth from defocus - Construction of 3D model from images.

UNIT 3 IMAGE PROCESSING AND MOTION ESTIMATION

9 Hrs.

Image preprocessing - Image representations (continuous and discrete) - Edge detection. Regularization theory - Optical computation - Stereo Vision - Motion estimation - Structure from motion.

UNIT 4 SHAPE REPRESENTATION AND SEGMENTATION

9 Hrs.

Contour based representation - Region based representation - Deformable curves and surfaces - Snakes and active contours - Level set representations - Fourier and wavelet descriptors - Medial representations - Multiresolution analysis.

UNIT 5 OBJECT RECOGNITION AND IMAGE UNDERSTANDING

9 Hrs.

Hough transforms and other simple object recognition methods - Shape correspondence and shape matching - Principal Component Analysis - Shape priors for recognition - Pattern recognition methods - HMM, GMM and EM - Application: Surveillance – Foreground background separation – Particle filters – Chamfer matching, tracking, and occlusion – Combining views from multiple cameras – Human gait analysis - Applications: In-vehicle vision system: Locating roadway – Road markings – Identifying road signs – Locating pedestrians.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, the student will be able to

- CO1 - Implement fundamental image processing techniques required for computer vision .
- CO2 - Understand Image formation process .
- CO3 - Extract features from images and do analysis of images .
- CO4 - Generate 3D model from images .
- CO5 - Understand video processing, motion computation and 3D vision and geometry .
- CO6 - Develop applications using computer vision techniques.

TEXT / REFERENCE BOOKS

1. David A. Forsyth, Jean Ponce, "Computer Vision: A Modern Approach", 2nd Edition, Pearson Education Limited, 2015
2. E. Trucco and A. Verri, "Introductory Techniques for 3D Computer Vision", Prentice Hall, 1998.
3. Mark Nixon and Alberto S. Aquado, "Feature Extraction and Image Processing for Computer Vision", 3rd Edition, Academic Press, 2012.
4. E. R. Davies, "Computer and Machine Vision", 4th Edition, Academic Press, 2012.
5. Richard Szeliski, "Computer Vision: Algorithms and Applications (CVAA)", Springer, 2010.
6. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.

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**

SCSB1232	EXPLORATORY DATA ANALYSIS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To focus on the significance of data and software tools.
- To emphasize the relationship between variables and gain knowledge about univariate data analysis.
- To explore multivariate data analysis and visualize the data.

UNIT 1 INTRODUCTION

9 Hrs.

EDA fundamentals –Understanding data science Significance of EDA Making sense of data - Comparing EDA with classical and Bayesian analysis– Software tools for EDA–Visual aids for EDA- Data transformation techniques - Merging database - reshaping and pivoting - Transformation techniques.

UNIT 2 THE EXPLORATORY PERSPECTIVE

9 Hrs.

Introduction: Overview – Sources of data – Process for making sense of Data - Describing Data: Observations and variables – Types of variables – Central tendency – Distribution of the data – Confidence intervals Hypothesis tests - Distributions of single variables.
Displaying Data: Stem and leaf Summarizing data Resistant statistics and number summaries - The Box and Whisker -Understanding data: Skewness Outliers Gaps and multiple peaks.

UNIT 3 RELATIONSHIPS BETWEEN VARIABLES

9 Hrs.

Preparing data tables: Cleaning - Displaying relationships - Scatter plot – Summarizing relationships – Fitting a line – Smoothing the data – Median and hinge traces – Examining residuals – Understanding relationships: Outliers Nonlinear monotonic relationships.

UNIT 4 REEXPRESSION AND UNIVARIATE ANALYSIS

9 Hrs.

Choosing Re-expressions: Nonlinear monotonic functions–Non monotonic functions - Introduction to single variable - Distribution variables–Numerical summaries of level and spread - Scaling and standardizing Inequality - Univariate data: Measures of center and spread, transformations.

UNIT 5 MULTIVARIATE ANALYSIS AND VISUALIZATION

9 Hrs.

Introducing a third variable–Causal explanations Three-variable contingency tables and beyond - Bivariate analysis – Multivariate analysis – Casual analysis - Basics of Matplotlib - Plotting with Pandas and Seaborn - Other Python visualization tools.

Max: 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Understand about the significance of exploratory data analysis.
- CO2** - Analyse the data statistically.
- CO3** - Summarize data and understanding their relationship.
- CO4** - Perform univariate data exploration and analysis.
- CO5** - Apply multivariate data exploration and analysis.
- CO6** - Perform data exploration and visualization techniques .

TEXT / REFERENCE BOOKS

1. Glenn J. Myatt, Wayne P. Johnson, "Making Sense Of Data | A Practical Guide To Exploratory Data Analysis And Data Mining ", Second Edition
2. Frederick Hartwig, Brian E. Dearing, "Exploratory Data Analysis ", 1979.
3. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python , " Packt Publishing, 2020.
4. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data" First Edition, O Reilly, 2017.
5. Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Analysis for Social Scientists ", Wiley Publications, 2nd Edition, 2008.

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**

SCSB3034	PREDICTIVE ANALYTICS AND SEGMENTATION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn about fundamentals of data modelling techniques.
- To gain knowledge about regression and classification.
- To understand more about additive and boosting methods.

UNIT 1 INTRODUCTION TO PREDICTIVE ANALYTICS

9 Hrs.

Need for Analytics - Introduction to Tools and Environment - Application of Modeling in Business - Databases and Types of data and variables - Data Modeling Techniques - Missing imputations etc. Need for Business Modeling - Regression Concepts -Blue Property-Assumptions-Least Square Estimation - Variable Rationalization - Model Building.

UNIT 2 REGRESSION AND CLASSIFICATION

9 Hrs.

Model theory - Model fit statistics - Model conclusion - Analytics applications to various business domains etc. - Regression vs Segmentation - Supervised and unsupervised learning - Tree building – Regression - Classification - Over fitting - Pruning and complexity - Multiple decision trees etc.

UNIT 3 MODEL ASSESSMENT AND SELECTION

9 Hrs.

Bias, variance and model complexity - Bias-variance trade off - Optimism of the training error rate - Estimate of in-sample prediction error - Effective number of parameters - Bayesian approach and BIC - Cross- validation - Boot strap methods, conditional or expected test error.

UNIT 4 ADDITIVE MODELS AND TREES

9 Hrs.

Additive models, trees, and related methods: Generalized additive models – Tree based methods – PRIM: Bump hunting - Multivariate adaptive regression splines - Hierarchical mixture of experts - Boosting methods- Numerical optimization via gradient boosting – Right-sized trees for boosting - Regularization.

UNIT 5 SURVIVAL ANALYSIS

9 Hrs.

Survival Analysis: Survival analysis measurements - Kaplan Meier analysis - Parametric survival analysis - Proportional hazards regression - Extensions of survival analysis models - Evaluating survival analysis models.

Max: 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Understand the concept of data analytics and modeling.
- CO2** - Analyze data and build models.
- CO3** - Apply the models and predict error.
- CO4** - Create additive models and trees.
- CO5** - Understand the usage of survival analysis.
- CO6** - Apply the prediction model for decision making for a given set of problems.

TEXT / REFERENCE BOOKS

1. Gareth James Daniela Witten Trevor Hastie Robert Tibshirani, "An Introduction to Statistical Learning with Applications in R", Springer, 2017.
2. John D. Kelleher, Brian Mac Namee, Aoife D'Arcy "Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms Worked Examples", MIT Press, 2nd Edition, 2020.
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning-Data Mining, Inference, and Prediction", Second Edition, Springer Verlag, 2009.
4. Dean Abbott, "Applied Predictive Analytics: Principles and Techniques for The Professional Data Analyst", Wiley, 2022.
5. Anasse Bari, Mohammad Chaouchi, Tommy Jung, "Predictive Analytics for Dummies", 2nd Edition, 2017.

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**

SCSB3035	COGNITIVE SCIENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn basics and develop skills in Cognitive Science with focus on acquisition.
- To understand the mind and intelligence that connects psychology, artificial intelligence, neuroscience and linguistics.
- To gain knowledge about the methods and tools to solve real time issues.

UNIT 1 INTRODUCTION TO COGNITIVE SCIENCE 9 Hrs.

Cognitive view – Fundamental concepts – Computers in cognitive science – Applied cognitive science – Interdisciplinary nature of cognitive science.

UNIT 2 COGNITIVE PSYCHOLOGY 9 Hrs.

Cognitive Psychology: Architecture of the mind - Nature of cognitive psychology - Global view of the cognitive architecture - Propositional representation - Schematic representation - Cognitive processes, Working memory, and attention - Acquisition of skill- Connectionist approach to cognitive architecture.

UNIT 3 LANGUAGE ACQUISITION, SEMANTICS AND PROCESSING MODEL 9 Hrs.

Milestones in acquisition – Theoretical perspectives- Semantics and cognitive science – Meaning and Entailment –Reference – Sense – Cognitive and computational models of semantic processing – Information processing models of the mind- Physical symbol systems and language of thought- Applying the symbolic paradigm- Neural networks and distributed information processing- Neural network models of cognitive processes.

UNIT 4 INTEGRATION CHALLENGE 9 Hrs.

Cognitive Science and integration challenge: Levels of explanation - Local integration -Tackling the Integration Challenge: Inter theoretic reduction - Marr's tri-level hypothesis - Models of mental architecture.

UNIT 5 NEURAL NETWORK MODELS OF COGNITIVE PROCESSES 9 Hrs.

Language learning - Neural network models of children's physical reasoning - Challenges and applications - The massive modularity hypothesis - Hybrid architectures - Tools: Working with concept maps.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Identify the relationships between cognitive systems with different cognitive disciplines.
- CO2** - Enumerate the various neuro scientific theories of cognitive systems.
- CO3** - Analyze the representation and use of knowledge by individual minds, brains, and machines.
- CO4** - Perform neuroscience and linguistics based real time experiments.
- CO5** - Implement the knowledge of neuro science with its advanced techniques towards the cognitive field.
- CO6** - Formulate hypothesis and computational models to draw conclusions that embeds cognitive psychology and neuroscience.

TEXT / REFERENCE BOOKS

1. Jose Luis Bermudez, "Cognitive Science: An Introduction to the Science of the Mind", Cambridge University Press, New York, 2014.
2. Neil Stillings, Steven E. Weisler, Christopher H. Chase and Mark H. Feinstein, "Cognitive Science: An Introduction", 2nd Edition, MIT press, 1995.

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**

SCSB3036	MALWARE DATA SCIENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the fundamental concepts and techniques of malware analysis and reverse engineering.
- To learn how to identify, classify, and analyze different types of malware, including viruses, worms, trojans, ransomware and others.
- To understanding the anatomy of malware, including how it spreads, hides, and communicates with command and control servers.

UNIT 1 INTRODUCTION AND STATIC ANALYSIS

9 Hrs.

Introduction: Malware analysis–Why malware analysis - Types of malware analysis– Static analysis: Determining the file type– Fingerprinting the malware– Extracting strings– Determining file obfuscation Comparing and classifying the malware.

UNIT 2 DYNAMIC ANALYSIS

9 Hrs.

Dynamic Analysis: System and network monitoring–Dynamic analysis monitoring tools - Dynamic analysis steps Tools Analyzing a malware executable Dynamic Link Library (DLL) analysis.

UNIT 3 MALWARE FUNCTIONALITIES AND PERSISTENCE

9 Hrs.

functionalities –Downloader –Dropper –Keylogger Malware command control– PowerShell-based execution. Persistence methods: Scheduled tasks – Startup folder – Winlogon registry entries – Image file execution options EOM hijacking Service.

UNIT 4 NETWORK CONSTRUCTION AND ANALYSIS

9 Hrs.

Identifying attack campaigns using malware networks: Nodes and edges - Bipartite networks - Visualizing malware networks–Building malware networks and shared image relationship network - Shared code analysis: Preparing samples - Using the Jaccard index and using similarity matrices for evaluation.

UNIT 5 DETECTION, EVALUATION AND VISUALIZATION

9 Hrs.

Understanding ML based malware detectors: Steps for building ML based detector - Types of machine learning algorithms - Evaluating malware detection systems - Building ML detectors: Decision Tree based Detector - Basic visualization.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand the concepts and techniques of malwares for system security.
- CO2 - Compare the techniques of static and dynamic methods to identify and classify malwares.
- CO3 - Analyze the functionalities of malware by applying persistence methods.
- CO4 - Construct the network and formulate the analysis test to detect malware for securing community applications.
- CO5 - Simulate a detector system and evaluate to scale better along with visualization.
- CO6 - Design a case study for any network with a malware detector and compare the performance of the various classifiers and algorithms.

TEXT / REFERENCE BOOKS

1. Monnappa K A, "Learning Malware Analysis", Packet Publisher, 2018.
2. Joshua Saxe and Hillary Sanders, "Malware Data Science – Attack Detection and Attribution", September 2018.
3. Michael Ligh, Steven Stair, "Malware Analyst's Cookbook and DVD: Tools and Techniques for Fighting Malicious Code", Wiley Publishing Inc., 2011.
4. Alexey Kleymenov and Amr Thabet, "Mastering Malware Analysis: The complete malware analyst's guide to combating malicious software, APT, cybercrime, and IoT attacks", Packt Publisher, 2019.

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**

SCSB3037	COMPREHENSIVE LINUX	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To emphasize the significance of server management concepts of an Enterprise Linux operating system.
- To comprehend the importance of GIT repositories and security vulnerability in Linux operating system.
- To explore the cloud level services offered by Linux operating system

UNIT 1 STARTING WITH LINUX

9 Hrs.

Understanding what Linux is - Exploring Linux history - Understanding how Linux differs from other operating systems - Understanding how Linux distributions emerged - Creating the perfect Linux desktop

- Lab: Ubuntu OS installation on virtual machines - Starting with the Ubuntu desktop live image - Handling Ubuntu desktop - Using the desktop - Understanding the importance of threads - Lab: Understanding basic desktop application management in Ubuntu - Adding an application launcher - Managing files and folders - Installing and managing additional software - Lab: Knowing advanced desktop application management in Ubuntu - Using tools - Lab: Configuring basic tools in Ubuntu OS - Working with shell in UBUNTU - Lab1: Getting acquainted with different types of shell - LAB3: Basic Shell management.

UNIT 2 GAINING ACCESS

9 Hrs.

Using the root user account - Exploring administrative commands, configuration files, and Log files - Using other administrative accounts - Lab: Implementing privilege escalation - Using shell variables, expanding arithmetic expressions Expanding variables - Lab: Manipulating environmental/shell variable - Getting information about commands and help - Managing user accounts in UBUNTU - User management - Lab: Managing regular user account - Group management - Lab: Group management - Moving around the file system UBUNTU - File management - Lab: Working with basic file system - Permission management - Lab: Working with file system permissions - Access control lists - Lab: Managing user and group permissions - Working with text files in UBUNTU.

UNIT 3 FILE MANIPULATIONS

9 Hrs.

Editing text files from shell prompt - Managing running processes - Process management - Lab: Monitoring process activity - Writing simple shell scripts - Understanding shell scripts - Lab: Implementing basic shell programs - Understanding server managing in RHEL - Install the server RHEL - Lab: RHEL 8 Installation on virtual machine - Initial server configuration - Lab: Configuring and verifying the initial server settings - Remote server management - Lab: RHEL Remote server management - Initial server configuration - Lab: Configuring and verifying the initial server settings - Remote server management- Lab: RHEL Remote Server management - File Transfer - Lab: Securely coping files between Servers - Log Management - Lab1: Monitoring system logs - Lab2: Recording and managing server logs - Server monitoring - Lab: Monitoring the health of the server.

UNIT 4 MANAGING SOFTWARE IN RHEL

9 Hrs.

System software and package management - administering networking in RHEL - Lab: Examining and configuring network in server - Starting and stopping services in RHEL - Lab: Managing daemons and services in RHEL - Configuring a web server in RHEL - Lab: Managing a basic webserver - Advance webserver management - Secure webserver - Lab: Securing the webserver effectively - Managing disks and file systems - Lab: Making simple partitions - Logical volume management - Lab: Implementing Logical Volume Management (LVM) - Configuring Samba server in RHEL - Lab: Deploy a samba share directory - Configuring an NFS file server in RHEL - Lab: Deploy a NFS Share export - Introducing container technology.

UNIT 5 INTRODUCTION TO GIT**9 Hrs.**

Getting started with GIT and its architecture - Lab: Installing and configuring GIT in RHEL - Remote repositories - Lab : Exploring GIT remote repository - Branching and merging - Lab: Learning and Exploring Branches in GIT - Configuring databases in LINUX - Lab: MariaDB (MYSQL) installation and configuration in RHEL - MongoDB - Lab: MongoDB installation and configuration in RHEL - Understanding Linux Security Os - Lab: Kali Linux installation on virtual machine - Description about different security tools in Kali Linux - Hands-on study on Nmap and Metasploit - Lab: Gathering information using NMAP – Metasploit - Lab: Vulnerability management using Metasploit - Knowing LINUX as cloud workhorse - Amazon Web Service (AWS)- Lab: Operating and Managing an EC2 Instance in AWS Cloud.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - Identify the need of a Linux operating system.
- CO2** - Know the process management functions of a Linux operating system.
- CO3** - Understand the need of users and group management in Linux operating system.
- CO4** - Find the significance of GIT repositories and databases.
- CO5** - Recognize the essentials of file management part of a Linux operating system.
- CO6** - Gain an insight on the importance of cloud and security in Linux operating system.

TEXT / REFERENCE BOOKS

1. "Comprehensive Linux for All ", Red Hat, 1st Edition, 2023.
2. Petersen, Richard, Red Hat Enterprise Linux 8: Desktops and Administration, Surfing Turtle Press, 2019.
3. Colino, Miguel Perez , " Red Hat Enterprise Linux 8 Administration: Master Linux Administration Skills ", Packt Publishing, 2021.
4. Günther, Tobias, "Learn Version Control with Git: A Step-By-step Course for the Complete Beginner, Independently Published, 2017.

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**

SCSB3038	ADVANCED COMPUTER NETWORKS	L	T	P	EL	Credits	Total Marks
		2	0	2	0	3	100

COURSE OBJECTIVES

- To introduce topics related to computer networks and internet operating system.
- To gain knowledge on how to develop products.
- To understand basics of Linux kernel architecture where the network devices based on and its interface with various products developed for these devices.

UNIT 1 LINUX KERNEL

9 Hrs.

Linux kernel programming introduction - Static and dynamic linking of modules - User vs kernel space - Systems calls - Makefile for modules. Shell Programming.

Practical: Write shell programs related to shell function - line count of several files and wait and sleep commands.

UNIT 2 NETWORK DRIVERS

9 Hrs.

Introduction to Network device drivers - Character device driver development - Process synchronization and scheduling - Interrupt handling - Kernel debugging.

Practical: Write a kernel program - compiling and inserting and removing a module in kernel

UNIT 3 eBPF - NETWORKING AND SECURITY

9 Hrs.

Basics of eBPF - Packet filters basics - Introduction to kernel's traffic control layer - Use of C for eBPF

Practical: Write a simple C program to interact with eBPF using syscall.

UNIT 4 NETWORK OPERATING SYSTEM PROGRAMMING MODULE

9 Hrs.

Introduction to Internet Operating System. Basics of Cisco IOS XR7 - Cisco IOS and Open Network Linux. Socket basics - Basics of client-server architecture - Basics of overlay networking and virtualization - Content delivery networks and network automation.

Practical: Write a simple C program on SNULL (Simple Network Utility for Loading Localities).

Write a C program to capture network packets.

UNIT 5 NETWORK DRIVERS TESTING

9 Hrs.

Socket basics - Loopback addressing - Structure of SNULL (Simple Network Utility for Loading Localities).

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Understand the fundamentals of Linux Kernel architecture.
- CO2** - Develop products related to advanced computer networks.
- CO3** - Deep knowledge in structure of networks to the protocol content and usage level.
- CO4** - Understand the internet operating systems running in routers and switches.
- CO5** - Develop products run in these networks and network devices.
- CO6** - Test and maintain the products run in the networks.

TEXT / REFERENCE BOOKS

1. Robert Love, "Linux Kernel Development", 3rd edition, Addison Wesley, 2010.
2. Andrew S.Tanenbaum, David J.Wetherall, "Computer Networks", 5th Edition, Pearson, 2019.
3. M J Bach, "The Design of the Unix Operating System", 1st Edition, Pearson Education, 2015.
4. J Cooperstein, "Writing Linux Device Drivers - A Guide with Exercises", Createspace, 2009.

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**

SITB3002	WEB DESIGNING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To define the principles of Web page design.
- To visualize the basic concept of HTML.
- To understand the basics concept of CSS.

UNIT 1 WEB DESIGN PRINCIPLES

9 Hrs.

Basic principles involved in developing a web site - Planning process - Five golden rules of web designing - Designing navigation bar - Page design - Home page layout - Design concept - Brief history of internet - What is World Wide Web - Why create a web site - Web standards - Audience requirement.

UNIT 2 INTRODUCTION TO HTML

9 Hrs.

What is HTML - HTML documents - Basic structure of an HTML document - Creating an HTML document - Mark up tags Heading - Paragraphs - Line breaks - HTML tags - Introduction to elements of HTML - Working with text - Working with lists, tables and frames - Working with hyperlinks, images and multimedia - Working with forms and controls.

UNIT 3 INTRODUCTION TO CASCADING STYLE SHEETS

9 Hrs.

Concept of CSS - Creating Style Sheet - CSS properties - CSS styling (Background, Text Format, Controlling Fonts) - Working with block elements and objects - Working with lists and tables - CSS Id and class - Box model (introduction, border properties, padding properties, margin properties) - CSS advanced (grouping, dimension, display, positioning, floating, align, pseudo class, navigation bar, image sprites, attribute selector) - CSS color - Creating page layout and site designs.

UNIT 4 INTRODUCTION TO WEB PUBLISHING OR HOSTING

9 Hrs.

Creating the web site - Saving the site - Working on the web site - Creating web site structure - Creating Titles for web pages - Themes-Publishing web sites.

UNIT 5 RESPONSIVE WEB DESIGN WITH BOOTSTRAP

9 Hrs.

Introduction to responsive design - Common device dimensions - Using CSS media queries - View-port tag - Basic custom layout - Introduction to bootstrap Installation of bootstrap Grid system Forms - Buttons Icons integration.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Infer web page design principles.
- CO2** - Create simple webpage using HTML forms and controls.
- CO3** - Design a webpage using CSS.
- CO4** - Create and publish website.
- CO5** - Develop web applications using responsive web design.
- CO6** - Application of bootstrap in website design.

TEXT / REFERENCE BOOKS

1. Kogent Learning Solutions, "Html 5 In Simple Steps", India: Dreamtech Press, 2010.
2. Steven M. Schafer , "HTML, XHTML, and CSS Bible", 5th edition, Wiley India, 2011.
3. Ian Pouncey, Richard York , "Beginning CSS: Cascading Style Sheets for Web Design", Wiley India, 2011.
4. Kogent Learning , "Web Technologies: HTML, Javascript", Wiley India,
5. Murray, To Lynchburg, "Creating a Web Page and Web Site", College, 2002.

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**

SCSB3006	SOFTWARE VULNERABILITY TESTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the fundamentals of testing and analyse the different methodologies.
- To conduct online web testing.
- To understand about Ethical hacking and information gathering methodologies.

UNIT 1 FUNDAMENTALS OF TESTING AND ANALYSIS 9 Hrs.

A Framework – Principles – Test and Analysis – Basic Techniques: Finite models – Dependency and data flow Symbolic executions Finite state verification.

UNIT 2 TESTING 9 Hrs.

Functional Combinational - Structural Data flow Model based Fault based Inspection Program analysis OO Testing Integration and component based System Acceptance Regression.

UNIT 3 INTRODUCTION TO WEB APPLICATIONS SECURITY 9 Hrs.

Threats and principles - Introduction to secure design - Web server: Introduction a secure setup of apache - Firewalling a server browser: General concepts Functionalities - Browsers war - Configuration - Attack to browsers - Users tracking / profiling - Browser security and secure browsing.

UNIT 4 ETHICAL HACKING 9 Hrs.

Five stages of hacking-Vulnerability Research-Legal implication of hacking - Impact of hacking - Foot printing and Social engineering. Information gathering methodologies: Competitive Intelligence- DNS Enumerations- Social Engineering attacks - Scanning and enumeration port scanning - Network scanning - Vulnerability Scanning - NMAP scanning tool - OS finger printing enumeration - System hacking password.

UNIT 5 SNIFFERS and SQL INJECTION ACTIVE AND PASSIVE SNIFFING 9 Hrs.

ARP Poisoning - Session Hijacking - DNS Spoofing - Conduct SQL injection attack – Counter measures - Cracking techniques - Key loggers - Escalating privileges - Hiding Files - Steganography technologies - Counter measures.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1** - Comprehend the concepts of Testing.
- CO2** - Gain knowledge of Vulnerability Testing,
- CO3** - Test web applications for Vulnerability.
- CO4** - Implement open password- protected files.
- CO5** - Design and implement vulnerable software applications.
- CO6** - Apply common phishing techniques.

TEXT / REFERENCE BOOKS

1. Software Testing and Analysis: Process, Principles, and Techniques, Mauro Pezze, Michal Young, Wiley Publications, 2008
2. The art of software security assessment : Mark Dowd, John McDonald, Justin Schuh, Pearson Education, 20021
3. The Art of Software Security Testing: Chris Wysopal, Lucas Nelson, Elfriede Dustin, Dino Dai Zovi, Pearson Education, 2006.
4. The Hacker Playbook 2: Peter Kim, Secure Planet, LLC, 2015.

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**

SCSB1231	DATA AND INFORMATION SCIENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn how to process raw data into formats necessary for analysis.
- To gain in-depth knowledge of fundamental data science concepts through motivating real-world case studies.
- To understand the methods of data handling and big data.

UNIT 1 DATA ACQUISITION

9 Hrs.

Data Acquisition – Sources of acquiring the data - Internal systems and external systems - Web APIs, Data preprocessing- Exploratory Data Analysis (EDA)- Basic tools (plots, graphs and summary statistics) of EDA -Open data sources, Data APIs, Web scrapping -Relational database access (queries) to process / access data.

UNIT 2 DATA PREPROCESSING AND PREPARATION

9 Hrs.

Data munging, wrangling - Data visualization basics -Plyr packages - Cast/Melt. Tableau: Creating visualizations in Tableau- Data hierarchies, filters, groups, sets, calculated fields - Map based visualizations - Build interactive dashboards - Data stories.

UNIT 3 DATA QUALITY AND TRANSFORMATION

9 Hrs.

Data imputation -Data transformation (minmax, log transform, z-score transform etc.,). - Binning, classing and standardization. Outlier / Noise and Anomalies.

UNIT 4 HANDLING TEXT DATA

9 Hrs.

Bag-of-words- Regular expressions - Sentence splitting and tokenization - Punctuations and stop words, incorrect spellings - Properties of words and word cloud - Lemmatization and Term-Document TxD computation -Sentiment analysis (Case Study).

UNIT 5 PRINCIPLES OF BIG DATA

9 Hrs.

Introduction to Big Data - Challenges of processing Big Data (Volume, Velocity and Variety perspective) - Use Cases.

Max.45Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Explore the fundamental concepts of Data science.

CO2 - Identify the basic data formats.

CO3 - Apply data preprocessing and data visualization techniques to data.

CO4 - Improve the data quality through various transformations.

CO5 - Implement the methods of handling text data.

CO6 - Analyse the challenges in processing Big Data.

TEXT / REFERENCE BOOKS

1. Jeroen Janssens Data Science at the Command Line , O'Reilly, 2015.
2. Wes McKinney, "Python for Data Analysis", O'Reilly, 2018.
3. Cathy O'Neil and Rachel Schutt, "Doing Data Science, Straight Talk from The Frontline ", O'Reilly. 2014.
4. Avrim Blum, John Hopcroft and Ravindran Kannan, "Foundations of Data Science", Cambridge University Press, 2020.

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**

SCSB3032	CLOUD COMPUTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the basic principles and implementation of cloud computing and different architecture available to deploy the cloud environment.
- To gain knowledge on the security issues that has to be considered on implementation of cloud.
- To understand on the various cloud storage systems.

UNIT 1 INTRODUCTION

9 Hrs.

Origins of Cloud computing—Cloud components - Essential characteristics—On-demand self-service - Broad network access - Location independent resource pooling -Rapid elasticity - measured service - Comparing cloud providers with traditional IT service providers - Roots of cloud computing.

UNIT 2 CLOUD INFRASTRUCTURE

9 Hrs.

Data center components: IT equipment and facilities design considerations: Requirements, Power, Efficiency and Redundancy Power Calculations - PUE and challenges in cloud data centers - Cloud management and cloud software deployment considerations – Virtualization - Types of virtualization – Implementation levels of virtualization (CPU, Memory, I/O).

UNIT 3 CLOUD ARCHITECTURE

9 Hrs.

Layers and models layers in cloud architecture - Software as a Service (SaaS) -features of SaaS and benefits - Platform as a Service (PaaS) - Features of PaaS and benefits - Infrastructure as a Service (IaaS) - Features of IaaS and benefits - Service providers - challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of cloud computing.

UNIT 4 CLOUD COMPUTING SOFTWARE SECURITY

9 Hrs.

Cloud information security objectives Confidentiality Integrity Availability - Cloud security services - Relevant cloud security design principles - Secure cloud software requirements - Secure development practices - Approaches to cloud software requirement engineering - Cloud security policy implementation.

UNIT 5 CLOUD STORAGE

9 Hrs.

Introduction to storage systems - Cloud storage concepts - Distributed File Systems (HDFS, Ceph FS) - Cloud databases (HBase, MongoDB, Cassandra, Dynamo DB) - Cloud object storage (Amazon S3, OpenStack Swift, Ceph).

Max 45 Hrs.

COURSE OUTCOMES

On completion of the course, the student will be able to

- CO1 - Implement the fundamental cloud computing environment.
- CO2 - Virtualize a cloud on the system .
- CO3 - Understand the various architecture that can be implemented in cloud.
- CO4 - Analyse various security issues while deploying the cloud.
- CO5 - Understand the process of storing in the cloud.
- CO6 - Develop applications by deploying a secured cloud environment.

TEXT / REFERENCE BOOKS

1. M. N., "Cloud Computing", Rao, India: Prentice Hall India Pvt., Limited, 2015.
2. Comer, D., "The Cloud Computing Book: The Future of Computing Explained United Kingdom: CRC Press, 2021.
3. John Wtinghouse, James F.Ransome, "Cloud Computing Implementation, Management and Security", CRC Press.
4. Ronald L. Krutz, Russell Dean Vines, "Cloud Security a Comprehensive Guide to secure Cloud Computing", Wiley.
5. Anthony T.Velte , Toby J. Velte Robert Elsenpeter , "cloud Computing A Practical Approach ", TATA McGraw- Hill , New Delhi, 2010

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**

SCSB3422	KNOWLEDGE MANAGEMENT SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSEOBJECTIVES

- To study the basic rudiments of knowledge management.
- To learn the coding tools and procedures.
- To explore the faster decision making with knowledge transfer systems.

UNIT 1 KNOWLEDGE MANAGEMENT

9 Hrs.

KM Myths ~~KM LifeCycle~~ Understanding Knowledge Knowledge, intelligence Experience Common Sense – Cognition and KM – Types of Knowledge – Expert Knowledge – Human Thinking and Learning.

UNIT 2 KNOWLEDGE MANAGEMENT SYSTEM LIFE CYCLE

9 Hrs.

Challenges in building KM systems – Conventional vs KM System Life Cycle (KMSLS) – Knowledge creation and knowledge architecture – Nonaka's model of knowledge creation and transformation - Knowledge architecture.

UNIT 3 CAPTURING KNOWLEDGE

9 Hrs.

Evaluating the expert ~~Developing a relationship with experts~~ Fuzzy reasoning and the quality of knowledge ~~Knowledge capturing techniques - Brain storming~~ Protocol analysis ~~Consensus Decision making~~ Repertory grid ~~Concept mapping~~ Black boarding.

UNIT 4 KNOWLEDGE CODIFICATION

9 Hrs.

Modes of knowledge conversion – Codification tools and procedures ~~Knowledge developer's sets – System testing and deployment~~ Knowledge testing ~~Approaches to logical testing, user acceptance testing~~ KM system deployment issues User training ~~Post implementation.~~

UNIT 5 KNOWLEDGE TRANSFER AND SHARING

9 Hrs.

Transfer Methods ~~Role of the Internet~~ Knowledge transfer in e-world ~~KM system tools – Neural Network – Association rules – Classification trees – Data mining and business intelligence – Decision making architecture~~ Data management ~~Knowledge management protocols~~ Managing knowledge workers.

Max. 45 Hrs.

COURSEOUTCOMES

On completion of the course the student will be able to

- CO1 - Understand the concept of knowledge and its types.
- CO2 - Analyse the challenges in building knowledge management systems.
- CO3 - Develop knowledge management capturing techniques.
- CO4 - Test the coding tools for knowledge management systems.
- CO5 - Understand the architecture and development of knowledge systems.
- CO6 - Develop models with Knowledge management system tools.

TEXT / REFERENCEBOOKS

1. Elias.M.Award, Hassan M.Ghaziri, "Knowledge Management", Pearson Education, 2007.
2. Becerra-Fernandez, Irma., Sabherwal, Rajiv. Knowledge Management: Systems and Processes. United Kingdom: Taylor & Francis, 2014.
3. Husain, Shabahat., Ermine, Jean-Louis, "Knowledge Management Systems: Concepts, Technologies and Practices", Emerald Publishing Limited, 2021.
4. C.W.Holsapple, "Handbooks on Knowledge Management", Springer Berlin Heidelberg, 2013.
5. Becerra-Fernandez, I.Sabherwal, R. , "Knowledge Management: Systems and Processes ", M.E.SharpeInc., 2010.

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**

SCSB1511	KNOWLEDGE REPRESENTATION AND REASONING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the foundations of KRR and the tradeoff between representation and reasoning.
- To understand which knowledge-based techniques are appropriate for which tasks.
- To apply KRR systems to research and challenging problems.

UNIT 1 INTRODUCTION

9 Hrs.

Introduction to Knowledge Base - Models and Knowledge-Based Agents - Challenges and issues in knowledge representation and reasoning - Nature of knowledge - Knowledge acquisition techniques - Classical logic.

UNIT 2 LOGIC BASED KNOWLEDGE REPRESENTATION

9 Hrs.

First-Order Logic: Syntax and semantics (predicates, variables, quantifiers), First-Order Logic Knowledge representation language - Model, interpretation, inferences in First Order Logic - Forward chaining - Backward chaining - Propositional Logic vs. First-Order Logic
Universal Instantiation - Existential Instantiation - Substitution and unification - Generalized MP rule - Soundness of GMP - Resolution inference rule - CNF logic programming Prolog.

UNIT 3 NON LOGIC BASED KNOWLEDGE REPRESENTATION

9 Hrs.

Semantic networks: Nodes, arcs, and semantic inheritance. Frames and scripts: Representing structured knowledge using attribute-value pairs and slots.
Conceptual graphs: Graphical representation of knowledge and its formal semantics.
Ontologies: Introduction to ontology languages (such as RDF, OWL) and their role in representing domain knowledge.

UNIT 4 KNOWLEDGE REPRESENTATION AND PLANNING

9 Hrs.

Ontological engineering—Categories and objects—Events Mental objects and modal logic—Reasoning systems for categories—Reasoning with default information - Classical planning— Algorithms for classical planning— Heuristics for planning— Hierarchical planning— Non-deterministic domains— time, schedule, and resources Analysis.

UNIT 5 APPLICATIONS OF KRR

9 Hrs.

Case studies in Artificial Intelligence: Applications of knowledge representation and reasoning in intelligent systems – Planning – Robotics - Natural language understanding and intelligent tutoring systems Intelligent agents Robotics and automation.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Understand the fundamental principles and challenges of knowledge representation and reasoning.
- CO2** - Review critical properties of a knowledge-based system.
- CO3** - Analyze different formalisms and languages used for representing knowledge.
- CO4** - Apply reasoning techniques to derive new knowledge from existing knowledge.
- CO5** - Design knowledge representation systems using logic-based and non-logic-based approaches.
- CO6** - Apply different modeling approaches to solve KRR Problems.

TEXT / REFERENCE BOOKS

1. Stuart Russell and Peter Norvig , "Artificial Intelligence: A Modern Approach", Prentice Hall, 2022 .
2. Ronald Brachman and Hector Levesque , "Knowledge Representation and Reasoning", MK Publishers, 2004.
3. Dean Allemang and James Hendler, "Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL", Elsevier Science, 2011.
4. Michael Gelfond and Yulia Kahl , "Knowledge Representation, Reasoning, and the Design of Intelligent Agents: The Answer-Set Programming Approach", Cambridge University Press, 2014. .

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**

SITB3004	FULL STACK WEB DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand and familiarize with JavaScript and NodeJS environments.
- To learn about NoSQL database and basics of MongoDB.
- To acquire knowledge of connecting the ReactJS frontend and ExpressJS backend.

UNIT 1 INTRODUCTION

9 Hrs.

Introduction to JavaScript Brief history of NodeJS and its alternatives Installing and setting up NodeJS environment Introduction to NPM package manager and registry - Introduction to callbacks and events
– File system access and handling streams – Introduction to common utility modules (OS, Path).

UNIT 2 NOSQL DATABASE WITH MONGODB

9 Hrs.

Introduction to NoSQL – Benefits and disadvantages of NoSQL databases – Introduction to MongoDB - Installing and setting up MongoDB environment – Data model design (Embedded and Normalized) – Database manipulation (Create, Drop, Create and Drop Collections) – Document manipulation (Insert, Delete, Update, Query (Limit, Sort, Aggregation)) – Projection – Introduction and setting up Mongoose ORM Handling models and queries with Mongoose.

UNIT 3 FRONTEND DEVELOPMENT WITH REACTJS

9 Hrs.

Introduction to ReactJS – Installation and creating a basic React application – Introduction to JSX – Components and props – State and lifecycle – Events and effects – Conditional rendering Introduction to HTTP requests and fetch Making HTTP GET and POST requests Handling data from API.

UNIT 4 BACKEND DEVELOPMENT WITH EXPRESSJS

9 Hrs.

Introduction to ExpressJS- Separating the tasks of frontend and backend – Installing and setting up ExpressJS environment – Introduction to APIs – Routing and URL building – Error handling Project directory structuring - Handling form data and request data – Handling and serving files – Authentication using session keys Handling request of multiple methods and their placement (GET, POST, DELETE, PATCH) Documenting an API.

UNIT 5 CREATING A FULL STACK WEB APPLICATION

9 Hrs.

React page with input fields Extracting and validating data from input field(s) Making a HTTP request with data from input field(s) Using Mongoose with an ExpressJS application Inserting document with data from HTTP request Writing, handling URL query parameters and using its values to write queries with Mongoose Displaying data returned from backend Handling errors in API requests.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Gain basic knowledge of JavaScript and its environment.

CO2 - Discuss NoSQL databases and delve deeper into it using MongoDB and performing basic database operations in it.

CO3 - Apply the concepts of JSX and ReactJS to display and manipulate data in a webpage and to make basic HTTP requests and handle them.

CO4 - Distinguish the roles of frontend and backend, and to work with ExpressJS.

CO5 - Develop a basic, complete API and interact with it from the ReactJS frontend.

CO6 - Create real time web applications.

TEXT /REFERENCE BOOKS

1. Bradshaw, Shannon., Brazil, Eoin., Chodorow, Kristina, “ MongoDB: The Definitive Guide: Powerful and Scalable Data Storage”, United States: O'Reilly Media, 2019.
2. Ethan Brown, “Web Development with Node and Express: Leveraging the JavaScript Stack” United States: O'Reilly Media, 2019.
3. Stefanov, Stoyan, “React: Up & Running”, United States: O'Reilly Media, 2021.

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**

SCSB3015	BLOCKCHAIN AND DISTRIBUTED	L	T	P	EL	Credits	Total Marks
	LEDGER TECHNOLOGY	3	0	0	0	3	100

COURSE OBJECTIVES

- To understand conceptual elements for blockchain and distributed ledger technologies.
- To acquire knowledge about blockchain, cryptocurrencies and distributed ledgers.
- To use Hyper Ledger Fabric and Ethereum platform to implement blockchain applications.

UNIT 1 INTRODUCTION TO BLOCKCHAIN, CRYPTOCURRENCIES AND DISTRIBUTED LEDGERS

9 Hrs.

Blockchain Distributed Ledgers - Cryptographic basics for cryptocurrency →Hashing - Signature schemes - Encryption schemes and elliptic curve cryptography - CAP theorem and blockchain - Categories of blockchains: Public, Private blockchains -Permissioned Ledger - Tokenized blockchains, Tokenless blockchains - Sidechains.

UNIT 2 ESSENTIALS OF CRYPTOCURRENCIES

9 Hrs.

Distributed identity: Public and private keys - Digital identification and wallets - Decentralized network - Distributed ledger: Permissioning framework -Blockchain data structure - Double spending - Network consensus - Sybil attacks - Block rewards and miners, Difficulty under competition - Forks and consensus chain - the 51% attack - Confirmations and finality - The limits of proof-of-work - Alternatives to proof of work.

UNIT 3 BLOCKCHAIN IMPLEMENTATION

9 Hrs.

Bitcoin: Bitcoin and Merkle Root - Eventual Consistency and Bitcoin - Byzantine Fault Tolerance - Bitcoin and Secure Hashing - Bitcoin block-size - Bitcoin Mining - Proof of Work (PoW) - Bitcoin Scripting. Blockchain Collaborative Implementations: Hyper ledger, Corda - ERC 20 and the token explosion.

UNIT 4 FUTURE USE CASES OF DISTRIBUTED LEDGER TECHNOLOGIES

9 Hrs.

Financial Services: Accounting and audit - Global payments - Programmable money - Citizen Identification - Voting - Healthcare: Electronic health records system - Supply chain management - Trade finance - Tokenization of real assets.

UNIT 5 DISTRIBUTED LEDGER TECHNOLOGY IN ALTERNATIVE BLOCKCHAIN

9 Hrs.

Alternative Blockchains: Kadena, Ripple, Stellar, Rootstock, Drivechain, Quorum - Transaction manager: Crypto Enclave - Quorum Chain - Network manager: Tezos, Storj, Madsafe, BigChainDB.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Understand the cryptographic basis for cryptocurrency.
- CO2** - Choose a blockchain implementation based on real time scenario.
- CO3** - Categorize the various types of blockchains.
- CO4** - Examine the techniques for anonymity preservation.
- CO5** - Identify and understand the use cases of distributed ledger technology.
- CO6** - Evaluate alternative Blockchains and their applicability.

TEXT / REFERENCE BOOKS

1. Treccani, A., Lipton, A., Blockchain and Distributed Ledgers: Mathematics, Technology, And Economics First Edition, Singapore: World Scientific Publishing Company, 2021.
2. Wattenhofer, R., "Blockchain Science: Distributed Ledger Technology ", 3rd Edition, United States: Independently Published, 2019.
3. Goldfeder, S., Bonneau, J., Miller, A., Felten, E., Narayanan, A. , "Bitcoin and Cryptocurrency Technologies ", First Edition, Princeton University Press, 2016.
4. Bashir, I., Mastering Blockchain: A Deep Dive Into Distributed Ledgers, Consensus Protocols, Smart Contracts, DApps, Cryptocurrencies, Ethereum, and More", 3rd Edition, United Kingdom: Packt Publishing, 2020.

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**

SCSB3025	STATISTICAL MACHINE LEARNING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand fundamental concepts, techniques of Statistical Learning.
- To know how the computer programs, detect human actions, images using pattern recognition.
- To understand Supervised Learning algorithms and Unsupervised Learning algorithms.

UNIT 1 STATISTICAL LEARNING

9 Hrs.

Statistical Learning: Estimate f - Supervised Vs Unsupervised Learning - Regression Vs Classification problems - Accessing Model Accuracy - The learning problem: Risk functions, Bias and Variance - Curse of Dimensionality.

UNIT 2 PREDICTION AND CLASSIFICATION

9 Hrs.

Linear Regression: Simple linear regression - Multiple linear regression - Multivariate regression - Classification: Overview of classification - Logistic regression - Support vector machine - Decision tree - Bayesian belief network - Comparison of classification methods.

UNIT 3 PATTERN RECOGNITION AND ANALYSIS

9 Hrs.

Means and distances - Fisher discriminant analysis - Singular value decomposition - PCA and LDA - Learning paradigms - Bayesian decision theory: Minimum error rate classifier - Parameter estimation: Maximum likelihood and Bayesian Estimation - Hidden markov models - Nonparametric techniques: Nearest Neighbor rules (KNN) - Parzen windows.

UNIT 4 CLUSTERING AND ENSEMBLE METHODS

9 Hrs.

Clustering: Partitional Hierarchical - Ensemble models: Types and techniques- Applications of Ensemble modelling - Evaluation measures- Hypothesis testing- Cross-validation and Hyper parameter optimization Bootstrapping and Uncertainties

UNIT 5 KERNEL METHODS, SURVIVAL ANALYSIS AND CASE STUDY

9 Hrs.

Kernel Methods: Mercer kernels - Kernel classification - Kernel PCA - Kernel tests of independence. Survival Analysis: Survival and censoring times Censoring - Kaplan-Meier Survival Curve Log-rank test - Regression models with survival response - Shrinkage for the Cox model. Case Study: Survival analysis of brain cancer data, Publication data and Call Center data.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1 - Apply appropriate statistical methods to analyze data.
- CO2 - Recognize objects/actions by applying pattern recognition techniques.
- CO3 - Apply Reasoning and Uncertainty using Supervised models.
- CO4 - Prediction and analysis of data using Unsupervised models.
- CO5 - Use Kernel methods to test data independence.
- CO6 - Analyze and do prediction of real time data.

TEXT / REFERENCE BOOKS

1. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, "Introduction to Statistical Machine Learning with Application in R", Springer, 2nd Illustrated Edition, 2021.
2. Bishop, Christopher M, "Pattern Recognition and Machine Learning", 2013.
3. John Shawe- Taylor, Nello Cristianini, "Kernel Methods for Pattern Analysis", Cambridge University Press, 2006.

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**

SCSB1251	ARTIFICIAL INTELLIGENCE SEARCH METHODS AND REASONING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn the different search strategies in AI.
- To gain knowledge in solving AI problems.
- To master the concepts of learning and communication in AI.

UNIT 1 BASIC SCIENCE BEHIND AI

9 Hrs.

Intelligence – Memory – Computation – Learning – AI's Foundation and History – Intelligent Agents: Features – Behaviour in the environment – Rationality – Nature and its structure – Case Study: AI programming languages history: LISP Prolog Python.

UNIT 2 SEARCHING TOWARDS SOLUTION

9 Hrs.

Searching Strategies: Informed search: BFS DFS – Depth Bounded DFS – Uninformed search: Heuristic functions – Hill climbing search – Best First Search – Local Maxima Solution Space search – Adversarial search – Constraint satisfaction problem Case Study: N-Queens problem.

UNIT 3 KNOWLEDGE: ROLE AND REPRESENTATION

9 Hrs.

Knowledge – Definition and management – Types: Declarative and procedural knowledge – Knowledge Engineering behind logical agents: Propositional Logic First Order Logic – Inference: Forward and Backward chaining Ontological engineering Case Study: Ontology based knowledge representation.

UNIT 4 APPROACHES BEHIND PLANNING AND REASONING

9 Hrs.

Algorithm for planning as state space search – Analysis of planning approach – Reasoning: Bayes Rule – Bayesian network and its approximation – Hidden Markov Model – Kalman Filters – Decision networks – Case Study: Wumpus World Problem.

UNIT 5 DECODING AND LEARNING INTELLIGENCE

9 Hrs.

Learning algorithms: Classification and Regression with linear model – Non-parametric models – Ensemble learning – Explanation based learning – Learning with hidden variables – AI real time applications – Case Study: Nature inspired computation.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1** - Identify 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 Bayes rule to solve the problems of societal concern
- CO6** - Design user centric applications using AI concepts.

TEXT / REFERENCE BOOKS

1. Stuart J. Russel, Peter Norvig, "Artificial Intelligence a Modern Approach", 4th Illustrated Edition, Pearson Education, 2021.
2. Elain Rich, Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill,
3. M. Tim Jones, "Artificial Intelligence: A Systems Approach (Computer Science)", Jones and Bartlett Publishers, Inc., 1st Edition, 2008.
4. David L. Poole and Alan K. Mackworth, Artificial Intelligence: Foundations of Computational Agents, 2nd Edition, 2010.
5. Ertel, Wolfgang, Introduction to Artificial Intelligence, 1st Edition, 2017.

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**

SCSB3039	ADVANCED DATA STRUCTURES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To acquire knowledge of organizing the data in a nonlinear fashion.
- To gain knowledge on balancing the height of trees to optimize the structure and search time.
- To understand the method of designing the table data structure and its applications

UNIT 1 TREE STRUCTURES

9 Hrs.

AVL Trees - Single rotation - Double rotation - Splay Trees - Red-Black Trees, B-Trees: Definition of B-trees, Basic operations on B-trees, Deleting a key from a B-tree. 2-3 Trees.

UNIT 2 DIGITAL SEARCH STRUCTURES

9 Hrs.

Digital Search trees, Binary tries and Patricia, Multiway Tries, Suffix trees, Standard Tries, Compressed Tries pattern matching - Introduction - The naive string-matching algorithm, The Rabin-Karp algorithm, The Knuth-Morris - Pratt algorithm.

UNIT 3 HEAPS

9 Hrs.

Introduction - Binary Heaps - Basic Heap Operations - Binomial Heaps/Queues - Binomial Queue Structure - Binomial Queue Operations - Implementation of Binomial Heaps.

UNIT 4 SETS

9 Hrs.

Sets: Representation - Operations on sets - The Disjoint sets class - Equivalence relation - Basic data structure - Union and find algorithms - Smart Union and Path compression algorithm - Applications.

UNIT 5 TABLES

9 Hrs.

Rectangular tables - Jagged tables - Inverted tables - Symbol tables - Static tree tables - Dynamic tree tables - Hash tables- Hash function - Separate chaining - Linear probing - Quadratic probing - Double hashing - Rehashing - Universal hashing - Extendible hashing.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Design and Implement operations on augmenting data structures.

CO2 - Apply string matching techniques for solving problems effectively.

CO3 - Apply the basic heap operations to design and implement various types of Heaps.

CO4 - Perform the operation like Union, find min, extract min and delete operation on sets.

CO5 - Design table data structure and apply it for many applications.

CO6 - Analyze the given scenario and choose appropriate Data Structure for solving problems.

TEXT / REFERENCE BOOKS

1. Jean-Paul Tremblay, Paul G. Sorenson, "An Introduction to Data Structures with Application", TMH, 2017.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 4th Edition, 2014.
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", 4th Edition, MIT Press, 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**

SCSB3642	INTELLIGENT ROBOTS AND DRONE	L	T	P	EL	Credits	Total Marks
	TECHNOLOGY	3	0	0	0	3	100

COURSE OBJECTIVES

- To explore the knowledge of intelligent robots.
- To explore the mechanism of drone technology.
- To understand the various applications of drones in real world.

UNIT 1 INTRODUCTION

9 Hrs.

Overview of robotics - Robotics in AI - Embedded systems-Agent task environment model - Embodied systems - Sensors and signal processing - Planning approaches to robot control: STRIPS and SHAKEY- Robot manipulator kinematics.

UNIT 2 APPROACHES

9 Hrs.

Control Theory: Feedback, feed forward and open loop control - Linear first order lag processes - Limitations of control theory- Probability Based Approaches: Markov Decision Processes (MDPs) - Navigation - Behaviour-Based Control: The subsumption architecture - Hybrid architectures - Formalising behaviour based control (SMDPs) - Adaptive approaches to robot control- Reinforcement learning for control- Model Based learning approaches to control- Learning maps - Evolutionary approaches.

UNIT 3 DRONE TECHNOLOGY

9 Hrs.

Drone Concepts - Terminologies - History of drone - Types of current generation of drones based on their method of propulsion - Drone design and fabrication: Classifications of the UAV - Overview of the main drone parts technical characteristics of the parts Function of the component parts.

UNIT 4 DRONE PROGRAMMING

9 Hrs.

Drones' configurations - Methods of programming drone - Download program - Install program on computer -Running Programs - Multirotor stabilization - Flight modes - Drone flying and operation - Concept of operation for drone flight modes - Drone accessories - Sensors - Onboard storage capacity Removable storage devices - Linked mobile devices and applications.

UNIT 5 DRONE MAINTENANCE

9 Hrs.

Drone commercial applications: Drones in agriculture - Drones in inspection of transmission lines and power distribution - Drones in filming and panoramic picturing - Future of drones : Miniaturization of drones - Increasing autonomy of drones - The use of drones in swarms.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1** - Understand the basics behind robotics and embedded systems.
- CO2** - Explain basic approaches behind robotic controls.
- CO3** - List out different terminologies and concepts behind drone.
- CO4** - Develop programs for drone movement and configuration.
- CO5** - Apply drone technology for various commercial applications.
- CO6** - Develop drones for real time societal needs.

TEXT / REFERENCE BOOKS

1. Nitin Goyal, Sharad Sharma, Arun Kumar Rana, Suman Lata Tripathi, "Internet of Things Robotic and Drone Technology," CRC Press, 2021.
2. Neil Wilkins, "Robotics: What Beginners Need to Know about Robotic Process Automation, Mobile Robots, Artificial Intelligence, Machine Learning, Autonomous Vehicles, Speech Recognition, Drones, and Our Future," Independently Published, 2019.

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**

SCSB3474	PRIVACY AND SECURITY IN	L	T	P	EL	Credits	Total Marks
	ONLINE SOCIAL MEDIA	3	0	0	0	3	100

COURSE OBJECTIVES

- To study the different encryption systems in social network
- To understand the importance of K-Anonymity
- To understand the types of attacks against individuals' privacy.

UNIT 1 ANALYSIS OF PRIVACY IN SOCIAL NETWORKS

9 Hrs.

Introduction to social media- Modern social media outlets-Three layered framework-Characteristics used to analyze social web privacy - Social Media : End users and Business - Privacy issues related to social web users- Privacy issues related to service providers -Security and privacy for digital facets - Identifiable facets - Private facets - Technological safeguards.

UNIT 2 ENCRYPTION FOR PEER-TO-PEER SOCIAL NETWORKS

9 Hrs.

Introduction to P2P bases OSN architecture -Essential criteria for the P2P encryption systems - Existing P2P OSN architectures - Evaluations of existing encryption schemes based on our criteria - Broadcast encryption - Predicate encryption -Survey of unethical behavior - Influencing factors.

UNIT 3 STEALING REALITY AND K-ANONYMITY

9 Hrs.

Stealing reality- Social attack model- Social learnability - k-anonymity - k-degree anonymity - k-neighborhood anonymity - k-automorphism - k-isomorphism - L-diversity - Attack model and privacy guarantee - Insights from an ℓ -diversified graph- Anonymization techniques.

UNIT 4 LINKS RECONSTRUCTION ATTACK AND BITCOIN SYSTEM

9 Hrs.

Privacy in social networks- Link prediction - Feature extraction- Communities datasets- Electronic currencies -Anonymity - Bitcoin System - Transaction network - User network- Anonymity analysis- Integrating off - Network information - Bitcoin faucet - Voluntary disclosures - TCP/IP layer information - Context discovery - Flow and temporal analyses.

UNIT 5 PRIVACY-PRESERVING DATA INTEGRATION USING DECOUPLED DATA

9 Hrs.

Record linkage - Privacy preserving computation - Use case and the threat model - Use case for privacy- Preserving record linkage- Threat model for privacy-preserving record linkage - Information and privacy - Sensitivity and identifiability - Decoupled data access model - Social Security numbers- Need for chaffing.

Max.45Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1 - Understand the concepts of privacy in social network.
- CO2 - Apply the different encryption techniques.
- CO3 - Apply the knowledge to steal and attack social model.
- CO4 - Understand the importance of bitcoin system.
- CO5 - Analyze the privacy preserving for decoupled data.
- CO6 - Develop the use-case models for privacy preservation.

TEXT / REFERENCE BOOKS

1. Yaniv Altshuler, Yuval Elovici, Armin B. Cremers Nadav Aharony, Alex Pentland, " Security and Privacy in Social Networks", 2014.
2. Liang, Xiaohui, "Security and Privacy in Mobile Social Networks", Springer New York, 2013.
3. Alex Pentland, Armin B. Cremers, Nadav Aharony, Yaniv Altshuler, Yuval Elovici, "Security and Privacy in Social Networks United States, Springer New York, 2014.

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**

SBAB4001	PRINCIPLES AND PRACTICES OF	L	T	P	EL	Credits	Total Marks
	MANAGEMENT	3	0	0	0	3	100

COURSE OBJECTIVES

- To analyse how the field of management has evolved and its significant contributions
- To analyse and apply the critical role of managers in modern organizational settings.
- To illustrate and evaluate the importance of planning, organizing, directing and controlling in decision making.

UNIT 1 INTRODUCTION

9 Hrs.

Definition, Functions, Process, Scope and Significance of Management. Nature of Management, Managerial Roles, Managerial Skills and Activities, Difference between Management and Administration. Significance of Values and Ethics in Management.

UNIT 2 SCHOOLS OF MANAGEMENT

9 Hrs.

Evolution of Management Thought - Contributions of F.W. Taylor, Henry Fayol, Elton Mayo, Approaches of Management Thought (including MBO and MBE) Functions of Management. Concept of Leadership-Theories and Styles.

UNIT 3 PLANNING AND ORGANIZING

9 Hrs.

Nature, Scope, Objective and Significance of Planning, Elements and Steps of Planning, Decision Making Organizing Principles, Span of Control, Line and Staff Relationship, Authority, Delegation and Decentralization. Effective Organizing, Organizational Structures, Formal and Informal Organizations, Staffing.

UNIT 4 DIRECTING

9 Hrs.

Effective Directing, Supervision, **Motivation**: Different Theories of Motivation - Maslow, Herzberg, Mc Clelland, Vroom, Porter and Lawler, Job Satisfaction. **Communication** Process, Channels and Barriers, Effective Communication.

UNIT 5 CONTROLLING AND COORDINATING

9 Hrs.

Elements of Managerial Control, Control Systems, Management Control Techniques, Effective Control Systems. Coordination Concept, Importance, Principles and Techniques of Coordination, Concept of Managerial Effectiveness.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Understanding of basic management concepts, principles, and practices.
- CO2** - Develop planning and decision-making strategies in an organization.
- CO3** - Summarize the concept and complete the process of organizing.
- CO4** - Develop an understanding of staffing, leadership, directing and motivation in an organization.
- CO5** - Predict the dynamics of controlling and its emerging issues in management.
- CO6** - Assess managerial practices and choices relative to ethical principles and standards.

TEXT / REFERENCE BOOKS

1. Stephen P. Robbins, David A. Decenzo, Fundamentals of Management , Pearson Education, 9th Edition.
2. Harold Koontz, O'Donnell and Heinz Weihrich, "Essentials of Management", New Delhi, 9th edition, Tata McGraw Hill.
3. "Management Fundamentals: Concepts, Applications, and Skill Development , 6th edition, Sage.
4. Richard L. Daft, Principles of Management , Cengage Learning.
5. Prasad, L.M., Principles and Practice of Management , Sultan Chand.
6. Jhunjhunwala J Mohanty, Management Principles and Applications , Himalaya Publishing House.

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**

S41BPB41	VENTURE CREATION	L	T	P	EL	Credits	Total Marks
		2	0	0	3	3	100

COURSE OBJECTIVES

- To develop an entrepreneurial mindset, understand the concept of entrepreneurship and identify personal strengths and weaknesses.
- To understand the design thinking process and apply design thinking to real-world problems.
- To identify problems and opportunities and develop ideas for new ventures by assessing market potential.
- To develop a value proposition, business model canvas, build MVP to create sustainable differentiation for the venture with a well-structured business plan, unit economics, go-to-market strategies and funding plan for managing business growth.
- To build an idea pitch and deliver it with confidence to potential stakeholders.

UNIT 1 INTRODUCTION TO ENTREPRENEURSHIP

9 Hrs.

Defining Entrepreneurship - evolution the concept and Emerging Trends in entrepreneurship (Domain specific) - Understanding the unique opportunities - Why be an entrepreneur? - Entrepreneurship in Indian Scenario and its role in economic development - Success stories of entrepreneur (Domain specific) -Entrepreneurial style assessment tool - Developing the entrepreneurial mindset - Attributes and skills - Recognizing your sweet spot for starting up -Principles of effectuation - Myths about entrepreneurship - Types of entrepreneurs - Entrepreneur vs Intrapreneur - Role of entrepreneurial teams.

UNIT 2 DESIGN THINKING AND OPPORTUNITY DISCOVERY

9 Hrs.

Introduction to Design Thinking for startups - Design thinking principles and process - Define the problem using design thinking principles and validate problem - Generation of ideas - Idea generation techniques and evaluating creative ideas - Identify problem worth solving - Sharpen your problem pitch.

UNIT 3 CUSTOMER, MARKETS AND CREATING A SUSTAINABLE DIFFERENTIATION 9 Hrs.

Differentiate between a customer and a consumer -Who is your customer and what is your segment - Customer job, pains, and gains using value proposition - Canvas - Build solution using value proposition canvas - Market estimation -TAM,SAM,SOM - Competitive analysis - Minimum viable product What is MVP - Build - Measure - Learn, differentiate between solution demo and MVP - How to validate MVP- Achieve a product Market fit.

UNIT 4 BUSINESS MODEL, BUSINESS PLANNING AND GO TO MARKET STRATEGIES 9 Hrs.

Introduction to Business model - Business plan - Lean approach 9 block lean canvas model - Financial feasibility: Costs, revenue streams - Pricing - Financial projections - Key financial metrics using financial template - Managing growth and targeting scale - Unit economics - Selecting the right channel - Introduction to digital marketing and tools -Branding strategy.

UNIT 5 FUNDING STRATEGY

9 Hrs.

Sources of funds: Debt and equity -Map the start-up lifecycle to funding options - Build an investor ready pitch deck.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Define entrepreneurship and explain emerging trends in entrepreneurship.

CO2 - Identify and evaluate business opportunities and assess market potential.

CO3 - Conduct customer discovery, market research, build a lean canvas, develop a business plan and marketing strategies.

CO4 - Identify sources of funding and develop a funding strategy, understand basic legal requirement for starting and running a business.

CO5 - Build an idea pitch and deliver it with confidence to various stakeholders.

TEXT / REFERENCE BOOKS

1. Hisrich, R. D., Peters, M. P., and Shepherd, D. A. , " Entrepreneurship" McGraw-Hill Education, 10th edition, 2017.
2. Ries, E. , " The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses Crown Business, 2011.
3. Blank, S. G., and Dorf, B., The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company ", KandS Ranch, 2012.
4. Roy, R., Indian Entrepreneurship: Theory and Practice New Delhi: Oxford University Press, 2017.
5. Chandan, J. S., and Rana, S. S., Entrepreneurship Development and Management", New Delhi: McGraw Hill Education, 2019.
6. Sinek, S., Start with Why: How Great Leaders Inspire Everyone to Take Action. Portfolio , " 2011.
7. Choudhary, R., and Mehta, N., From Zero to One: How to Build a Successful Startup in India", Notion Press, 2019.
8. Osterwalder, A., and Pigneur, Y., Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers John Wiley and Sons, 2010.
9. Mitra, P., and Banerjee, A. Startup Minds: The Entrepreneur's Journey from Idea to Success", SAGE Publications India, 2019.
10. Thiel, P. , " Zero to One: Notes on Startups, or How to Build the Future", Crown Business, 2014.
11. Zappos, T., Delivering Happiness: A Path to Profits, Passion, and Purpose. Business Plus , " 2010.

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

SCSB4006	SOFTWARE PROJECT MANAGEMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the fundamental principles of software project management.
- To have a good knowledge of responsibilities of project manager.
- To be familiar with the different methods and techniques used for project management

UNIT 1 INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT 9 Hrs.

Introduction to Software Project Management - Activities covered by software project management – Plans - Methods and methodologies - Categorizing software projects - Project evaluation and programme management - Project portfolio management - Evaluation of individual projects – Cost benefit evaluation techniques - Risk evaluation - Programme management - Managing the allocation of resources within programme management - An overview of project planning.

UNIT 2 SELECTION OF APPROPRIATE PROJECT APPROACH, EFFORT ESTIMATION 9 Hrs.

Selection of an appropriate project approach - Choosing methodologies and technologies - Software processes and process models - Choice of process models - Structure versus speed of delivery - Software effort estimation - Problems with over and under-estimates - Software effort estimation techniques - Bottom-up estimation - Top-down approach and Parametric models - Expert judgment - Estimating by analogy - COCOMO model - Cost estimation - Staffing pattern - Effect of schedule compression.

UNIT 3 ACTIVITY PLANNING AND RISK MANAGEMENT 9 Hrs.

Activity planning - Project schedules - Projects and activities - Sequencing and scheduling activities - Network Planning models - Risk management - Categories of risk - Risk Management approaches - A Framework for dealing with risk - Risk identification - Risk assessment - Risk planning - Risk management - Boehm's Top 10 risks and counter measures - Resource allocation - Nature of resources - Identifying resource requirements - Scheduling resources - Creating critical paths - Counting the cost.

UNIT 4 MONITORING AND CONTROL 9 Hrs.

Monitoring and control - Creating the framework - Collecting the data - Review - Visualizing progress - Cost monitoring - Earned value analysis - Prioritizing monitoring - Getting the project back to target - Change control - Software configuration management - Managing contracts - Managing people in software environment - Understanding behavior - Organizational behavior - Selecting the right person for the job - Instruction in the best methods - Motivation - The Oldham—Hackman job characteristics model - Stress management.

UNIT 5 SOFTWARE QUALITY 9 Hrs.

Software quality - Importance of software quality - Defining software quality - Software quality models - ISO 9126 - Product and process metrics - Product versus process quality management - Quality Management Systems - Process capability models - Techniques to help enhance software quality - Testing - Software reliability - Quality plans.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Apply project management concepts and techniques to an IT project.
- CO2** - Identify issues that could lead to IT project success or failure.
- CO3** - Explain project management in terms of the software development process.
- CO4** - Describe the responsibilities of IT project managers.
- CO5** - Apply project management concepts through working in a group as team leader
- CO6** - Be an active team member on an IT project.

TEXT / REFERENCE BOOKS

1. Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", TMH Edition 6, 2018.
2. Walker Royce, "Software Project Management", Pearson Edition, 2005.
3. Stellman and Greene, "Applied Software Project Management" 1st Edition, Kindle Edition.
4. Richard Thayer, Edward Yourdon, "Software Engineering Project Management", WILEY.
5. Jack Marchewka, "Information Technology Project Management providing measurable organizational value", 5th Edition, Wiley, 2016.

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

SCSB1714	SMART PRODUCT DEVELOPMENT	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To introduce basic working principles of sensor devices.
- To understand the different interface mediums for communication.
- To impart knowledge on different automation systems.

UNIT 1 INTRODUCTION TO SENSOR DEVICES

9 Hrs.

Piezoresistive pressure sensor - Piezoresistive accelerometer - Capacitive sensing- Accelerometer and microphone - Resonant Sensor and vibratory Gyroscope – Low power, low voltage sensors - Micro electro mechanical systems analysis and design of MEMS devices- Nano sensors.

UNIT 2 INTERFACING SENSOR INFORMATION AND MCU

9 Hrs.

Amplification and signal conditioning - Integrated signal conditioning - Digital conversion - MCU control MCUs for sensor interface techniques and system considerations - Sensor integration.

UNIT 3 CONTROL TECHNIQUES AND STANDARDS

9 Hrs.

Control of sensors using State Machines - Fuzzy Logic - Neural Networks - Adaptive control. Control application using - CISC, RISC, DSP control and IEEE 1451 standards.

UNIT 4 COMMUNICATION FOR SMART SENSORS

9 Hrs.

Wireless data communications - RF Sensing–Telemetry - Automotive protocols - Industrial networks home automation - MCU protocols

UNIT 5 SMART CITY – CASE STUDY

9 Hrs.

Smart adaptive advertising - Customized digital experience - Disaster prevention - Smart agriculture - Smart health - Smart security and surveillance - Smart virtual assistance Leadership and policy maker - Challenges and solutions in building AI - IoT - Case study: IoT application for water and waste management.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, the student will be able to

- CO1 - Identify the requirements of product design.
- CO2 - Analyse the different designs.
- CO3 - Develop different interfaces.
- CO4 - Work in different communication medium.
- CO5 - Understand the automation process.
- CO6 - Develop applications using AI technique.

TEXT / REFERENCE BOOKS

1. Adrian McEwen and Hakim Cassimally, "Designing the Internet of Things", Wiley, 2014.
2. Krzysztof Iniewski, "Smart Sensors for Industrial Applications (Devices, Circuits, and Systems)" CRC Press, 2017.
3. Anbazhagan k, "IOT Google, Amazon Alexa, Signal Jammer, ESP 8266 NodeMCU and Location Tracker : New model technology development", 2019.

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**

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

S31LBH11	ADVANCED DATA STRUCTURES AND ALGORITHMS	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To understand and analyze fundamental data structures, such as binary search trees, disjoint sets and self-adjusting lists.
- To state the significance of the different types of tree structures.
- To develop the ability to design and analyze basic algorithms and prove their correctness using the appropriate data structure.

UNIT 1 INTRODUCTION TO ALGORITHMS

12 Hrs.

Role of Algorithms in Computing - Analyzing Algorithms - Designing Algorithms - Asymptotic Notations - Summations - Formulas and Properties - Recurrences - Sorting Techniques: Heap Sort – Quick Sort - Radix Sort - Bucket Sort - Analysis of Sorting Algorithms.

Practical:

1. Implementation of Heap sort
2. Implementation of Quick sort
3. Implementation of Radix sort
4. Implementation of Bucket sort

UNIT 2 TREE STRUCTURES

12 Hrs.

Binary Search Trees- AVL Trees - Red-Black Trees - B-Trees - Splay Trees - Heap Structures: Min/Max Heaps - Leftist Heaps - Binomial Heaps - Fibonacci Heaps.

Practical:

1. Implement the following operations on Binary search tree a) Insert b) Delete c) Display.
2. Perform a Binary search for a given set of integer values.

UNIT 3 MULTIMEDIA STRUCTURES

12 Hrs.

Segment Trees - K-D Trees - Point Quad Trees - MX-Quad Trees – R Trees - TV Trees.

Practical:

1. Program to implement Segment tree.
2. Implement the Quad tree.

UNIT 4 PROBLEM SOLVING TECHNIQUES

12 Hrs.

Branch and Bound - NP Hard and NP Complete Problems - Huffman Coding - Activity Networks - Flow Shop Scheduling - Randomized Algorithms - Greedy Algorithms – Backtracking - Dynamic Programming - Divide and Conquer.

Practical:

1. To find the solution for the knapsack problem using the greedy algorithms.

UNIT 5 GRAPH ALGORITHMS

12 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.

Practical:

1. To find a single source shortest path for a given graph.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Determine the time and space complexities for searching and sorting algorithms.
- CO2** - Implement algorithms like binary tree, Red-Black tree and heap structures.
- CO3** - Design and implement solutions to problems using Segment tree and Quad tree structures.
- CO4** - Implement Greedy algorithms and divide and conquer techniques.
- CO5** - Implement graph traversal algorithms..
- CO6** - Apply the various algorithm design techniques and data structures to real world solve problems.

TEXT / REFERENCE BOOKS

1. Thomas H Coreman, Charles E. Leiserson, Ronald L.Rivest ,“Introduction to Algorithms”, Mc. Graw Hill , 2009.
2. Sara Baase, Allenran Gelda, “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, 2006.
5. Aho A.V., Hopcroft J.E. and Ullman J.D. ,“Design and Analysis of Computer Algorithms”, 2006.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice
each unit of internal choice - each carrying 14 Marks
70 Marks

30 Marks PART B: 2 Questions from

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. Stenfnno Ceri and Gieusppepelagatti, "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**

SCSB5102	ADVANCED DATABASES SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To gain knowledge on the object orientated database concepts.
- To identify and resolve distributed database design and implementation issues
- To develop in-depth knowledge about web and intelligent databases.

UNIT 1 OBJECT ORIENTED DATABASES**9 Hrs.**

Database System Concepts and Architecture: Three-Schema Architecture and Data Independence - Entity Relationship Model: Entity Types - Entity Sets - Attributes and keys - Relationships Types and Instances - ER Diagrams - Naming conventions and Design Issues - Object oriented databases – Introduction – Weakness of RDBMS – Object Oriented Concepts: Storing Objects in Relational Databases – Next Generation Database Systems – Object Oriented Data Models – OODBMS Perspectives – Persistence – Issues in OODBMS – Object Oriented Database Management System Manifesto – Advantages and Disadvantages of OODBMS.

UNIT 2 DISTRIBUTED DATABASES**9 Hrs.**

Distributed DBMS Concepts and Design – Introduction – Functions and Architecture of DDBMS – Distributed Relational Database Design – Transparency in DDBMS– Distributed Transaction Management – Concurrency Control – Deadlock Management – Database Recovery – The X/Open Distributed Transaction Processing Model – Replication Servers – Distributed Query Optimization - Distribution and Replication in Oracle.

UNIT 3 WEB DATABASES**9 Hrs.**

Web Technology and DBMS – Introduction – The Web – The Web as a Database Application Platform – Scripting languages – Common Gateway Interface – HTTP Cookies – Extending the Web Server – Java – Microsoft's Web Solution Platform – Oracle Internet Platform – Semi structured Data and XML – XML Related Technologies – XML Query Languages.

UNIT 4 INTELLIGENT DATABASES**9 Hrs.**

Enhanced Data Models for Advanced Applications – Active Database Concepts and Triggers – Temporal Database Concepts – Deductive Databases – Knowledge Databases.

UNIT 5 CURRENT TRENDS**9 Hrs.**

Mobile Database – Geographic Information Systems – Genome Data Management – Multimedia Database – Parallel Database – Spatial Databases - Database administration – Data Warehousing and Data Mining.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - Describe the fundamental elements of database management systems.
- CO2** - Design and develop distributed databases.
- CO3** - Develop database driven web applications using the acquired knowledge.
- CO4** - Create data models for advanced applications.
- CO5** - Implement the geographic information systems.
- CO6** - Design contemporary information management systems.

TEXT / REFERENCE BOOKS

1. Thomas M. Connolly, Carolyn E. Begg, "Database Systems - A Practical Approach to Design, Implementation and Management", 6th Edition, Pearson Education, 2019.
2. Ramez Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", 4th Edition, Pearson Education, 2004.
3. M. Tamer Ozsu, Patrick Valdurriel, "Principles of Distributed Database Systems", 2nd Edition, Pearson Education, 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**

SISB9101	RESEARCH METHODOLOGY AND IPR	L	T	P	EL	Credits	Total Marks
		3	1	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts of research.
- To provide an insight into the techniques of research.
- To learn the requisites of writing a research report.
- To impart knowledge on formulation of research problem , research methodology , ethics involved in doing research and importance of IPR protection.

UNIT 1 RESEARCH PREPARATION AND PLANNING**9 Hrs.**

Objectives of research – Understanding research and its goals - Critical thinking - Techniques for generating research topics. Topic selection and justification. Techniques involved in designing a questionnaire – Methods of scientific enquiry – Formulation of hypotheses and testing of the same – Development of a research proposal.

UNIT 2 RESEARCH RESOURCES**9 Hrs.**

Sources of information. Literature search. World Wide Web - Online data bases – search tools. Citation in dices – Principles underlying impact factor – Literature review – Case studies - review articles and Meta analysis – Role of the librarian. Ethical and moral issues in Research - Plagiarism - tools to avoid plagiarism.

UNIT3 ACADEMIC WRITING AND PRESENTATION**9 Hrs.**

Proposal submission for funding agencies - Elements of Style. Organization of proposals - Basic knowledge of funding agencies - Research report writing - Communication skills - Tailoring the presentation to the target audience – Oral presentations - Poster preparations - Submission of research articles for Publication in Reputed journal - Thesis writing and Research report writing. Elements of excellent presentation: preparation - visual and delivery - oral communication skills and oral defense.

UNIT 4 DATA COLLECTION - ANALYSIS AND INFERENCE**9 Hrs.**

Basic statistical distributions and their applications. Sample size determination and sampling techniques. Large sample tests and small sample tests.

UNIT 5 INTELLECTUAL PROPERTY RIGHTS**9 Hrs.**

Nature of Intellectual Property: Patents - Designs - Trade Mark and Copyright. Process of Patenting and Development: technological research - innovation - patenting & development. Procedure for grants of patents - Patenting under PCT. Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the important basics of research and Intellectual Property Rights **CO2** -

Write research problem formulations through various methods of literature survey **CO3** -

Analyze research related information and Follow research ethics

CO4 - Correlate the results of any research article with other published results. Write a review article in the field of engineering

CO5 - Differentiate patents, copyrights, trademark and designs.

CO6 - Apply the process for IPR protection

TEXT / REFERENCE BOOKS

1. Cooper Donald R, Schindler Pamela S and Sharma JK , "Business Research Methods", Tata McGraw Hill Education, 11e (2012).
2. Catherine J. Holland, "Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets", Entrepreneur Press, 2007.
3. David Hunt, Long Nguyen, Matthew Rodgers, "Patent searching: tools & techniques", Wiley, 2007.
4. The Institute of Company Secretaries of India, Statutory body under an Act of parliament - "Professional Programme Intellectual Property Rights - Law and practice", 2013.
5. James C. Van Horne, "Financial Management and Policy", Prentice Hall.
6. James R. McGuigan, R. Charles Moyer, Frederick H. Harris, "Managerial economics, applications, strategy and Tactics", Cengage learning, India.
7. Philip Kotler, "Marketing management", Pearson Education, India.
8. Elwood S. Buffa and Rakesh Sarin, "Modern Production / Operations Management", Wiley, India.
9. Ronald R. Sims, "Organizational success through effective human resources Management", Quorum books, London.
10. Ganesan R, "Research Methodology for Engineers", MJP Publishers, 2011.

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

SCSB5201	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	L	T	P	EL	Credits	Total Marks
		3	1	0	1	3	100

COURSE OBJECTIVES

- To introduce basic artificial intelligence concepts, methodologies, and applications.
- To learn about different algorithms and their applicability in real-world scenarios.
- To understand the features of machine learning to apply on real world problems.

UNIT 1 INTRODUCTION TO ARTIFICIAL INTELLIGENCE**9 Hrs.**

Introduction to AI- Intelligent Agent -Search Methods and Knowledge representation- Use cases of AI – Role of Machine Learning- Machine Learning Tools & Package.

UNIT 2 ARTIFICIAL INTELLIGENCE**9 Hrs.**

Plotting for exploratory data analysis (EDA) - Linear Algebra- Probability and Statistics- Dimensionality reduction and Visualization: PCA (principal component analysis)- (t-SNE) T-distributed Stochastic Neighborhood Embedding.

UNIT 3 REAL WORLD PROBLEM**9 Hrs.**

Real world problem: Predict rating given product reviews on Amazon- Classification and Regression Models: K-Nearest Neighbors- Classification algorithms in various situations- Performance measurement of models- Naive Bayes- Logistic Regression- Linear Regression- Solving Optimization Problems.

UNIT 4 MACHINE LEARNING ALGORITHMS**9 Hrs.**

Support Vector Machines (SVM)- Decision Trees-Ensemble Models- Random Forest-Unsupervised Learning- K-Means Clustering – Ridge Regression.

UNIT 5 CASE STUDIES**9 Hrs.**

Quora question Pair Similarity Problem- Personalized Cancer Diagnosis-Facebook Friend Recommendation using Graph Mining-Taxi demand prediction in Indian Cities-Stack overflow tag predictor- Microsoft Malware Detection.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - Apply AI techniques to find solutions to a variety of engineering applications.
- CO2** - Understand the fundamental concepts involved in developing effective AI systems.
- CO3** - Interpret the various classification algorithms and its efficiency.
- CO4** - Demonstrate proficiency in applying scientific method to models of machine learning..
- CO5** - Investigate the issues involved in building solutions for real-world applications.
- CO6** - Apply the algorithms to a real problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

TEXT / REFERENCE BOOKS

1. Stuart Russell and peter Norvig, " Artificial Intelligence- A Modern Approach", 4th Edition, Pearson Education, 2022.
2. Em Alpaydin, "Introduction to Machine Learning", MIT Press, 4th Edition, 2020.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice
M.E. /

30 Marks

REGULATIONS

PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

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-Dynamic Non 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.**

VPN-Remote-Access VPN-site-to-site VPN-Tunneling to PPP-Security in VPN-MPLS-Operation– Routing - Tunneling and Use of FEC - Traffic Engineering and MPLS based VPN - Overlay Networks - P2P Connections - IPv4 vsIPv6.

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.

Max. 45 Hrs.**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**

- Deleted Content

S31LBH21	COMPUTER NETWORKS AND SECURITY	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To understand the different types of networks, transmission methodologies and layered protocols.
- To gain knowledge on the different types of cryptographic algorithms.
- To compare and contrast technologies in networking and security designed to solve similar problems.

UNIT 1 INTRODUCTION**12 Hrs.**

Data Communication - Transmission Methodologies - Data Link Layer - Multiple Access and Local Area Networks - Connecting Devices and Backbone Networks - Network Layer and Transport Layer - Application Layer.

Practical:

1. To find IP address of a machine.
2. Time and Date server.
3. Echo UDP server.

UNIT 2 MOBILE & WIRELESS NETWORKS**12 Hrs.**

Wireless networking - wireless LANS and PANS - Ad-hoc Wireless Networks and Security - Wireless Sensor Networks- Cellular Mobile Wireless Networks - Evolution of Modern Mobile Wireless Communication System.

Practical:

1. Demonstration of a Peer-to-Peer network topology using Coordinator and end device network device types.
2. Topology discovery using distributed algorithms.

UNIT 3 CRYPTOGRAPHY AND NETWORK SECURITY**12 Hrs.**

Introduction to the Concept of Security - Cryptographic Techniques - Computer-based Symmetric and Asymmetric Key Cryptographic Algorithms - Public Key Infrastructure (PKI) - Internet Security Protocols - Network Security- Database security - Data management Technologies - Information Security - Information Management Technologies- Security policies -Policy enforcement and related issues - Design Principles - Multilevel Relational Data Models- Security Impact on Database Function- Inference Problem Software Security Defining a Discipline.

Practical:

1. Write a program to perform encryption and decryption using the following algorithms:
 - i. Ceaser Cipher
 - ii. Substitution Cipher
 - iii. Hill Cipher
2. Write a program to implement the DES algorithm logic.

UNIT 4 RISK MANAGEMENT FRAMEWORK**12 Hrs.**

Code review with tools- Architectural risk analysis- Software penetrating testing- Risk Based security Testing - An Enterprise S/W security program - Security knowledge Intrusion detection -Defining Intrusion Detection - Security concepts - Determining strategies for Intrusion Detection - Responses - Vulnerability Analysis - Credentialed approaches - Technical issues.

Practical:

1. Study the working of Suricata for real time intrusion detection (IDS) - inline intrusion prevention (IPS) - and network security monitoring (NSM).

2. Study Moloch - the open-source full-packet capturing - indexing - and database tool aims to extend existing security infrastructure by storing and indexing network traffic.

UNIT 5 BIOMETRIC SECURITY

12 Hrs.

Biometric Fundamentals- Types of Biometrics - Fingerprints and Hand Geometry - Facial and Voice Recognition- Iris and Retina Scanning- Signature Recognition and Keystroke Dynamics - Behavioral and Esoteric Biometric Technologies - Issues Involving Biometrics – Privacy - Policy and Legal Concerns Raised by Biometrics.

Practical:

1. Face Recognition using Images
2. Fingerprint Examination

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Describe the foundations of communication, network and transmission along with its devices, types, topologies and protocols.
- CO2** - Evaluate the different wireless networks using distributed algorithms.
- CO3** - Classify the various security algorithms and implement in the various security applications. **CO4** - Identify and implement the various risk based security algorithms in real world applications. **CO5** - Design various biometric security applications.
- CO6** - Create security plans and address network and computer security issues in an organization.

TEXT / REFERENCE BOOKS

1. Stallings William, "Computer Networks and Security ", 7th Edition , Pearson,2017.
2. ManojS. Kavedia, Dr.Urmila Abjeet,"Computer Networks and Security", 2021.

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

- Added Content

SCSB5301	CYBER SECURITY AND PROTOCOLS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To acquire a basic understanding of security threats, target assets and vulnerabilities.
- To classify the various protocol and cryptography signatures
- To understand the protocols being implemented in real life situation.

UNIT 1 INTRODUCTION**9 Hrs.**

Introduction: Security threats - Sources of security threats- Motives - Target Assets and vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers - Insider threats - Cyber crimes. Network Threats: Active/ Passive – Interference – Interception – Impersonation – Worms – Virus – Spam’s – Ad ware - Spy ware – Trojans and covert channels – Backdoors – Bots – IP - Spoofing - ARP spoofing - Session Hijacking - Sabotage-Internal treats Environmental threats - Threats to Server security.

UNIT 2 SECURITY ELEMENTS**9 Hrs.**

Security Elements: Authorization and Authentication - types - policies and techniques – Security certification - Security monitoring and Auditing - Security Requirements Specifications – Security Policies and Procedures - Firewalls - IDS - Log Files - Honey Pots

UNIT 3 BASIC PROTOCOL**9 Hrs.**

Protocol Building Blocks - Communication Using Symmetric Cryptograph -One Way Hash Functions - Communication using Public Key Cryptography - digital signatures - signature with encryption - Random and Pseudo random sequence generation - Basic Protocols: key exchange - Interlock Protocol
- Key Exchange with Digital Signatures - Key and Message Broadcast - Basic Protocols: Authentication using hash functions - Authentication using public key cryptography.

UNIT 4 INTERMEDIATE PROTOCOLS**9 Hrs.**

Intermediate Protocols: Time stamping services - Arbitrated Protocol - Linking Protocol - subliminal channels - Elgamal Subliminal Channel - Undeniable Digital signatures: Chaum protocol - Proxy signatures - Group signatures - Bit Commitment using symmetric cryptography - Bit Commitment using hash functions - fair coin flips - coin flipping protocol using hash functions and public key cryptography - key escrow.

UNIT 5 ADVANCED PROTOCOLS**9 Hrs.**

Advanced Protocols: Zero knowledge proofs - Zero knowledge proof for identity - interactive ZKP: Graph Isomorphism - Hamiltonian Cycles - Non-interactive Zero knowledge proof - blind signatures - identity based public key cryptography - Oblivious transfer - oblivious signatures - Simultaneous contact signing - Digital certified Mail - Esoteric protocols - secure elections.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - Explore the cyber security world, threats present and how the target can be exploited.
- CO2** - Segregate the various elements of cyber security.
- CO3** - Understand the various cyber security protocols.
- CO4** - Interpret the various intermediate protocols.
- CO5** - Comprehend the advanced protocols for security.
- CO6** - Develop operational and strategic cyber security policies and strategies.

TEXT / REFERENCE BOOKS

1. Swiderski, Frank and Syndex, “Threat Modeling”, Microsoft Press, 2004.
2. William Stallings and Lawrie Brown, “Computer Security: Principles and Practice”, Prentice Hall, 4th Edition, 2017.

3. Joseph M Kizza , “Computer Network Security” , Springer Verlag, 2005.
4. W. Stallings, “Cryptography and Network Security: Principles and Practice”, Prentice Hall, 7th Ed ., 2017.
5. B. Schneier, “Applied Cryptography: Protocols - Algorithms and Source Code in C” - John Wiley & Sons - 2nd Ed. - 2015.
6. Bernard Menezes - “Network Security and Cryptograph”, Cengage Learning, 2nd Ed., 2012.
7. Menezes, P. van Oorschot, S. Vanstone, “Handbook of Applied Cryptography”, CRC press, Hardcover Edition, 2018.
8. Dong, Ling, Chen, Kefei, “Security Analysis Based on Trusted Freshness”, 1st Ed., Springer, 2012.
9. Johannes Buchman, “Introduction to Cryptography”, 2nd Ed., Springer, 2012.

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**

SCSB6301	COMPUTER VISION LAB	L	T	P	EL	Credits	Total Marks
		0	0	2	0	2	100

COURSE OBJECTIVES

- To learn the Basic image processing techniques.
- To understand the shapes and regions of images.
- To apply the different techniques in image pre-processing.
- To know the 3D vision techniques.
- To implement segmentation techniques.

LIST OF EXPERIMENTS

1. Display of gray scale images.
2. Histogram Equalization.
3. Design non-linear filtering.
4. Determination of edge detection using operators.
5. 2-D DFT and DCT.
6. Filtering in Frequency domain.
7. Display of colour images.
8. Conversion between colour spaces.
9. DWT of images.
10. Segmentation using watershed transform.

SCSB7001	ADVANCED SOFTWARE PLANNING AND MANAGEMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To realise Software Project Management.
- To identify the objectives, various characters and how to apply the various techniques to plan the Project.
- To identify the evaluation and estimation techniques to apply in various project.

UNIT 1 INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT 9 Hrs.

Definition of a Software Project (SP) - SP Vs. other types of projects activities covered by SPM - categorizing SPs - project as a system - management control - requirement specification - information and control in organization - Objectives - issues - and problems relating to software projects - role of the software project manager.

UNIT 2 PROJECT PLANNING 9 Hrs.

Stepwise Project planning: Introduction - selecting a project - identifying project scope and objectives - identifying project infrastructure - analyzing project characteristics - identifying project products and activities - estimate efforts each activity - identifying activity risk - allocate resources - review/ publicize plan - forecasting demand for product - proposal writing - requirement analysis - legal issues (patent - copyright - liability - warranty) - Cost –benefit Analysis - Cash flow forecasting - plan documentation methods: PERT and CPM.

UNIT 3 PROJECT EVALUATION & ESTIMATION 9 Hrs.

Cost benefit analysis - cash flow forecasting - cost benefit evaluation techniques - risk evaluation. Selection of an appropriate project report - Albrecht function point analysis - Problem in software estimation - Size Estimation: Function Point Analysis - Mask II FPA - LOC estimation - Conversion between size measures - Effort - schedule and cost estimation: Estimation factor - COCOMO-II - Putnam Estimation Model - Estimation by Analogy - Validating Software Estimates.

UNIT 4 ACTIVITY PLANNING AND MANAGING RESOURCE ALLOCATION 9 Hrs.

Activity planning and Managing Resource Allocation: Objectives of activity planning - project schedule - projects and activities - sequencing and scheduling activities - network planning model - representation of lagged activities - adding the time dimension - backward and forward pass - identifying critical path - activity throat - shortening project - precedence networks. Introduction - the nature of resources - identifying resource requirements - scheduling resources creating critical paths - counting the cost - being specific - publishing the resource schedule - cost schedules Risk Management: Introduction - the nature of risk - managing risk - risk identification - risk analysis - reducing the risks - evaluating risks to the schedule - calculating the z values.

UNIT 5 MANAGING CONTRACTS AND PEOPLE 9 Hrs.

Introduction - types of contract - stages in contract – placement - typical terms of a contract - contract management – acceptance - managing people and organizing terms: instruction in the best methods – motivation - working in groups - becoming a team - decision making - leadership - organizational structures - Software Quality The place of software quality in project - planning - the importance of software quality - defining software quality - ISO 9126 Practical software quality measures - product versus process quality management.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Describe basics of Software Project Management.
- CO2** - Competent to know project planning for various projects.
- CO3** - Identify the various project evaluation and estimation techniques.
- CO4** - Layout the Activity Planning and Resource Allocation.
- CO5** - Apply Managing people and organizing terms.
- CO6** - Ability to design real life project schedule.

TEXT / REFERENCE BOOKS

1. Bob Hughes and Mike Cotterell, "Software Project Management", 3rd edition, Tata McGraw Hill Publishing Company Ltd., New Delhi - 2011.
2. Tom Glib, Finzi Susannah, "Principles of Software Engineering Management", Addison Wesley, England.
3. Pankaj Jalote, "Software Project Management in Practice", Pearson Education Asia.
4. Watts S. Humphrey, "Winning with Software? An Executive Strategy", Pearson Education Asia.
5. Philip Metzger, "Managing a Programming Project", Prentice Hall, New Jersey.
6. Kishore - Swapna, "Software Requirements and Estimation", Tata McGraw Hill, 2001.

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

SCSB7002	ADVANCED COMPUTATIONAL COMPLEXITY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To acquire the various computational and circuit complexity theory.
- To recognize how to work along with Computational goals.
- To develop Counting classes, interactive proofs and algorithms.

UNIT 1 INTRODUCTION TO COUNTING COMPLEXITY

9 Hrs.

Counting complexity – Counting classes: #P - FP - GaP - Parsimonious reductions - #P- completeness - Examples of counting problems - Permanent is #P-complete - Valiant's theorem - Quantifiers versus counting: Valiant-Vazirani Lemma - Unique SAT - randomized reductions - Toda's theorem.

UNIT 2 CIRCUIT COMPLEXITY

9 Hrs.

Circuit Complexity – Sequential versus parallel computation - Boolean circuits - basis and complete basis - Shannon's lower bound - Lupanov's upper bound - Circuit complexity classes – NC - SAC - AC and their relation to other complexity classes - Constant depth reductions - Space bounded computation – Branching programs - Bounded width branching programs and Barrington's theorem.

UNIT 3 CIRCUIT LOWER BOUNDS

9 Hrs.

Circuit lower bounds – Gate elimination technique - Formula lower bounds - Subbotovskaya and Neciporuk's lower bound - Random restrictions - Parity cannot be computed by AC0 circuits - Razborov-Smolensky polynomial approximation method and ACC lower bounds - Razborov's proof of clique lower bounds for monotone circuits.

UNIT 4 INTERACTIVE PROOFS

9 Hrs.

Interactive Proofs – Motivation and definition - AM - MA proof systems - Sum check protocol - Random self-reducibility and interactive proof for Permanent.

UNIT 5 INTRODUCTION TO HARDNESS AND RANDOMNESS

9 Hrs.

Hardness versus Randomness - Pseudorandom generators - Nisan Wigderson generator - DE randomizing BPP under worst case assumption – Impagliazzo - Kabanets theorem.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Describe basics of Counting Complexity theorem.
- CO2** - Competent to know about Circuit Complexity theorem.
- CO3** - Classify various lower bounds.
- CO4** - Able to know the various proofs
- CO5** - Ability to design ACC Lower Bounds.
- CO6** - Recognize Hardness, Randomness and how it related .

TEXT / REFERENCE BOOKS

1. Dexter C Kozen , "Theory of Computation", (ISBN-13:978-1846282973), 2013.
2. Sanjeev Arora and Boaz Barak, "Computational Complexity: A modern approach", (ISBN- 13:978-0521424264).
3. Oded Goldreich, "Computational Complexity: A Conceptual Perspective", (ISBN-13:978-0521884730).
4. Ding-Zu Du and Ker-I Ko,"Theory of Computational Complexity"(ISBN-13:978-0471345060).
5. Heribert Vollmer ,"Introduction to Circuit Complexity: A Uniform Approach", (ISBN-13:978-0324006384).
6. Stasys Jukna, "Boolean Function Complexity: Advances and Frontiers", (ISBN-13:978-3642245077).

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**

SCSB7006	BLOCKCHAIN ARCHITECTURE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To introduce Blockchain and other Design goals.
- To study the algorithms and techniques in block chain.
- To design, code, deploy and execute a Decentralized Applications.

UNIT 1

9 Hrs.

Blockchain Basics-Introduction to Blockchain-History: Digital Money to Distributed Ledgers-Design Primitives: Protocols - Security - Consensus - Permissions - Privacy-Blockchain Architecture and Design- Basic crypto primitives: Hash - Signature-Hash chain to Block chain-Basic consensus mechanisms-Consensus-Requirements for the consensus protocols-Proof of Work (PoW)- Scalability aspects of Blockchain consensus protocols-Permissioned Blockchains-Design goals- Consensus protocols for Permissioned Blockchains

UNIT 2

9 Hrs.

Hyper ledger Fabric and Blockchain Use-cases-Hyper ledger Fabric I- Decomposing the consensus process 2.2 Hyper ledger fabric components- Chain code Design and Implementation-Hyper ledger Fabric II- Beyond Chain code: fabric SDK and Front End 2.5 Hyper ledger composer tool-Use case I: Blockchain in Financial Software and Systems (FSS)-Settlements - KYC - 8 Capital markets - Insurance-Use case II: Block chain in trade/supply chain - Provenance of goods - visibility - trade/supply chain finance - invoice management/discounting - etc.

UNIT 3

9 Hrs.

Blockchain for Government and Blockchain Security-Use case III: Blockchain for Government-Digital identity - land records and other kinds of record keeping between -government entities - Public distribution system / social welfare systems - Blockchain Cryptography- Privacy and Security on Blockchain-

UNIT 4

9 Hrs.

Research Aspects and Advanced Topics-Research aspects I-Scalability of Blockchain consensus Protocols-Case Study – Various recent works on Scalability-Research aspects II-Secure cryptographic protocols on Blockchain-Case Study – Secured Multi-Party Computation. Blockchain for science: making better use of the data-mining network- Case Studies: Comparing Ecosystems - Bitcoin - Hyperledger - Ethereum and more

UNIT 5

9 Hrs.

Hands-on Blockchain Tools and Technologies-Development of Blockchain Application using Hyperledger Fabric-Department of Computer Science and Engineering-The LNMIIT - Jaipur- Development of Decentralized applications (DApps) in Bitcoin- Smart Contract development in Ethereum and Solidity

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Discuss the basic concepts and idea behind the Blockchain.

CO2 - Explain various terms associated with the Blockchain and cryptocurrency

CO3 - Comprehend the applicability of Blockchain in various applications

CO4 - Develop distributed application (DApps) for various domains **CO5**

- Apply various technology to design and develop DApps **CO6** -

Describe the Various Tools and Technologies

TEXT / REFERENCE BOOKS

1. Joseph J. Bambara, Paul R. Allen and Kedar Iyer, Michael Wuehler, Rene Madsen, Solomon Ledererm, "Blockchain: A Practical Guide to Developing Business - Law - and Technology Solutions", McGraw-Hill Education, 1st edition - 2018.
2. Melanie Swan, "Blockchain: Blueprint for a new economy", O'Reilly Media Inc., 1st edition, 2015.
3. Bob Dill, David Smits, "Zero to Blockchain - An IBM Redbooks course", <https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html>.
4. Blockchain for Dummies, IBM <https://www.ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=XIM12354USEN>.
5. Andreas Antonopoulos, "Mastering Bitcoin: Programming the Open Blockchain", 2nd Edition, 2017.
6. Narayan Prusty, "Building Blockchain Projects", PACKT Publishing Ltd - 1st edition - 2017.

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

SCSB7007	ETHICAL HACKING AND DIGITAL FORENSICS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn various hacking techniques and attacks.
- To know how to protect data assets against attacks from the Internet.
- To enable students to understand issues associated with the nature of forensics.

UNIT 1 HACKING WINDOWS

9 Hrs.

Hacking windows – Network hacking – Web hacking – Password hacking - A study on various attacks – Input validation attacks – SQL injection attacks – Buffer overflow attacks - Privacy attacks.

UNIT 2 TCP/IP AND FIREWALLS

9 Hrs.

TCP / IP – Checksums – IP Spoofing port scanning - DNS Spoofing. Dos attacks – SYN attacks - Smurf attacks - UDP flooding - DDOS – Models. Firewalls – Packet filter firewalls - Packet Inspection firewalls – Application Proxy Firewalls - Batch File Programming.

UNIT 3 COMPUTER FRAUD

9 Hrs.

Fundamentals of Computer Fraud – Threat concepts – Framework for predicting inside attacks – Managing the threat – Strategic Planning Process.

UNIT 4 ARCHITECTURE STRATEGIES

9 Hrs.

Architecture strategies for computer fraud prevention – Protection of Web sites – Intrusion detection system – NIDS - HIDS – Penetrating testing process – Web Services – Reducing transaction risks.

UNIT 5 FRAUD SELECTION AND DETECTION

9 Hrs.

Key Fraud Indicator selection process - customized taxonomies – Key fraud signature selection process – Accounting Forensics – Computer Forensics – Journaling and its requirements – Standardized logging criteria – Journal risk and control matrix – Neural networks – Misuse detection and Novelty detection.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Comprehend the various hacking windows
- CO2** - Experience the TCP/IP, Spoofing, DOS attacks
- CO3** - Identify the fundamentals of computer fraud, threats concepts
- CO4** - Recognize to know architecture strategies for computer protection
- CO5** - Apply to the key for fraud indicator selection process
- CO6** - Implement the prevention techniques against the computer fraud.

TEXT / REFERENCE BOOKS

1. Kenneth C.Brancik, "Insider Computer Fraud", Auerbach Publications Taylor & Francis, Group 2008.
2. Ankit Fadia, "Ethical Hacking", 2nd Edition Macmillan India Ltd, 2006.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice
unit of internal choice - each carrying 14 Marks

30 Marks PART B: 2 Questions from each
70 Marks

SCSB7008	ADVANCED MOBILE COMPUTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To know the introduction about Mobile Computing
- To comprehend the Mobile Agent, Fault Tolerance
- To recognize the applications of Mobile Agent

UNIT 1 INTRODUCTION TO MOBILE COMPUTING

9 Hrs.

Introduction to Mobile Computing – Mobile Technology and Generation – characteristics of GSM and CMDA- Service architecture of GSM and Mobile Computing - characteristics - applications and Security issues of Mobile Computing- Middleware and Gateway of Mobile Computing- Mobile IP and Mobile Communication protocols.

UNIT 2 INTRODUCTION TO ANDROID

9 Hrs.

Introduction to Android- Analyze opensource Technology - Mobile Technology- Framework - SDK - Emulation- Android Application Structure- Android Activities Life Cycle and UI Layout.

UNIT 3 DATA MANAGEMENT ISSUES

9 Hrs.

Data management issues - data replication for mobile computers - adaptive clustering for mobile wireless networks - File system - Disconnected operations.

UNIT 4 MOBILE AGENTS COMPUTING

9 Hrs.

Mobile Agents computing - security and fault tolerance - transaction - processing in mobile computing environment.

UNIT 5 APPLICATIONS

9 Hrs.

Toast - Menu - Dialog - List and Adapters .

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Comprehend the Mobile Computing concepts.

CO2 - Demonstrate Android activities life cycle

CO3 - Recognize the Data Management issues in the mobile.

CO4 - Describe about the security and fault tolerance of mobile computing environments.

CO5 - Grasp about the various operations on working with menu, list and various adapters.

CO6 - Implement the various techniques of mobile computing in applications.

TEXT / REFERENCE BOOKS

1. Mike McGrath , "Building Android Apps in Easy Steps", McGraw -Hill Publications.
2. Mark L Murphy , "Beginning Android", Wiley India Pvt. Ltd.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice
unit of internal choice - each carrying 14 Marks

30 Marks PART B: 2 Questions from each

70 Marks

SCSB7009	CYBER DIGITAL TWINS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To know the introduction about cyber digital
- To perceive the how to manage the risk of the digital twin.
- To recognize the applications where the digital twin is implemented.

UNIT 1 INTRODUCTION

9 Hrs.

Introduction- Cyber Digital twin-definition-uses and benefits-need for digital twin-working principle Technology Digital thread-digital shadow-building blocks of digital twin-digital twin technology drivers and enablers.

UNIT 2 TYPES OF DIGITAL TWIN

9 Hrs.

Types of digital Twin-Based on Product and Process-Based on Functionality-Based on Maturity. Development Considerations-Overview of Data-Modeling Environment. Modelling-model and data Management-Managing data-implementing the model- Cloud and IOT technologies.

UNIT 3 CYBER RANGE Vs DIGITAL TWIN

9 Hrs.

Cyber range vs digital twin-human behavior modeling in digital twin-optimization using digital twin-digital twin and cyber Security-Techniques. Technologies-Industrial IOT and Digital Twin-simulation and digital Twin-Machine learning and digital twin-virtual reality and digital twin-cloud technology and digital twin.

UNIT 4 RISK ASSESSMENT

9 Hrs.

Digital twin and Risk Assessment-Digital twin reference Model-Implementation-Development of risk assessment Plan-Development of communication and control System-Development of digital twin Tools-Integration-platform Validation-Difficulties-Practical implications.

UNIT 5 APPLICATIONS

9 Hrs.

Applications: Digital Twin in Manufacturing-Digital Twin in Automotive-Digital Twin in Healthcare-Digital Twin in Utilities-Digital Twin in Construction.

Max. 45 Hrs

COURSE OUTCOME

On completion of the course, student will be able to

- CO1 - Comprehend the basic principles of the cyber digital twin.
- CO2 - Classify the different types of digital twins.
- CO3 - Recognize the Cyber Range and the digital Twin
- CO4 - Get to know how to manage the risk of the digital twin
- CO5 - Identify Digital Twin applications in Manufacturing, Automotive and Healthcare
- CO6 - Implement the cyber digital twin technology

TEXT / REFERENCE BOOKS

1. Michael E. AuerKalyan Ram B.Digital ,“Cyber-physical System and Digital Twins”, Part of the Lecture Notes in Networks and Systems book series.
2. Nassim Khaed, Bibin Pattel and Affan Siddiqui, “Development and Deployment on the Cloud”, Elsevier 2020.
3. Clint Bodungen,Bryan Singer,Aaron Shbeeb,Kyle Wilhoit, and Stephen Hilt, “Hacking Exposed Industrial Control Systems: ICS and SCADA Security Secrets & Solutions”, ISBN: 978- 1259589713.
4. Eric D. Knapp and Raj Samani,“Applied Cyber Security and the Smart Grid: Implementing Security Controls into the Modern Power Infrastructure”, The Art of Invisibility , Kevin Mitnick - 2017.

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**

SCSB7010	KNOWLEDGE ENGINEERING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn about knowledge representation schemes and reasoning.
- To have a thorough understanding of action planning and its representation.
- To gain skill in designing agents for the real world problems.

UNIT I INTRODUCTION

9 Hrs.

Key concepts – Why knowledge Representation and Reasoning – Language of first order Logic – Syntax - Semantics Pragmatics – Expressing Knowledge – Levels of Representation – Knowledge Acquisition and Sharing – Sharing Ontologies – Language Ontologies –Language Patterns – Tools for Knowledge Acquisition

UNIT 2 RESOLUTION AND REASONING

9 Hrs.

Proportional Case – Handling Variables and Qualifies – Dealing with Intractability – Reasoning with Horn Clauses - Procedural Control of Reasoning – Rules in Production – Description Logic - Vivid Knowledge – Beyond Vivid.

UNIT 3 REPRESENTATION

9 Hrs.

Object Oriented Representations – Frame Formalism – Structured Descriptions – Meaning and Entailment - Taxonomies and Classification – Inheritance – Networks –Strategies for Defensible Inheritance – Formal Account of Inheritance Networks.

UNIT 4 DEFAULTS - UNCERTAINTY AND EXPRESSIVENESS

9 Hrs.

Defaults – Introduction – Closed World Reasoning – Circumscription – Default Logic Limitations of Logic – Fuzzy Logic – Nonmonotonic Logic – Theories and World – Semiotics – Auto epistemic Logic - Vagueness – Uncertainty and Degrees of Belief – Noncategorical Reasoning – Objective and Subjective Probability.

UNIT 5 ACTIONS AND PLANNING

9 Hrs.

Explanation and Diagnosis – Purpose – Syntax - Semantics of Context – First Order Reasoning – Modal Reasoning in Context – Encapsulating Objects in Context – Agents – Actions – Situational Calculus – Frame Problem – Complex Actions – Planning – Strips – Planning as Reasoning – Hierarchical and Conditional Planning.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Describe basics of key concepts syntax and grammar
- CO2 - Learn about variables and qualifies and rules in production
- CO3 - Distinguish the representations of frame,structure
- CO4 - Classify the various logic in the knowledge engineering
- CO5 - Gain the ability to know the semantic and logical form word senses
- CO6 - Comprehend the concept of grammar, phrases.

TEXT / REFERENCE BOOKS

1. Ronald Brachman, Hector Levesque, "Knowledge Representation and Reasoning", The Morgan Kaufmann Series in Artificial Intelligence, 2004.
2. John F. Sowa, "Knowledge Representation: Logical - Philosophical - and Computational Foundations", 2000.
3. Arthur B. Markman, "Knowledge Representation", Lawrence Erlbaum Associates, 1998.

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**

SCSB70011	BIO-INSPIRED COMPUTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To Learn bio-inspired theorem and algorithms
- To Comprehend random walk and simulated annealing
- To Examine swarm optimization and ant colony for feature selection

UNIT 1 INTRODUCTION

9 Hrs.

Introduction to algorithm - Newton ' s method - optimization algorithm - No-Free-Lunch Theorems - Nature-Inspired Metaheuristics -Analysis of Algorithms -Nature Inspires Algorithms -Parameter tuning and parameter control.

UNIT 2 RANDOM WALK AND ANEALING

9 Hrs.

Random variables - Isotropic random walks - Levy distribution and flights - Markov chains - step sizes and search efficiency - Modality and intermittent search strategy - importance of randomization- Eagle strategy- Annealing and Boltzmann Distribution - parameters -SA algorithm - Stochastic Tunneling.

UNIT 3 GENETIC ALGORITHM AND DIFFERENTIAL EVOLUTION

9 Hrs.

Introduction to genetic algorithms and - role of genetic operators - choice of parameters - GA variants - schema theorem - convergence analysis - introduction to differential evolution - variants - choice of parameters - convergence analysis - implementation.

UNIT 4 SWARM OPTIMIZATION AND FIREFLY ALGORITHM

9 Hrs.

Swarm intelligence - PSO algorithm - accelerated PSO - implementation - convergence analysis - binary PSO - The Firefly algorithm - algorithm analysis - implementation - variants- Ant colony optimization toward feature selection.

UNIT 5 APPLICATION IN IMAGE PROCESSING

9 Hrs.

Bio-Inspired Computation and its Applications in Image Processing: An Overview - Fine- Tuning Enhanced Probabilistic Neural Networks Using Meta-heuristic-driven Optimization - Fine-Tuning Deep Belief Networks using Cuckoo Search - Improved Weighted Threshold Histogram Equalization Algorithm for Digital Image Contrast Enhancement Using Bat Algorithm - Ground Glass Opacity Nodules Detection and Segmentation using Snake Model - Mobile Object Tracking Using Cuckoo Search.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Implement bio-inspired algorithms in applications.
- CO2 - Explain random walk and simulated annealing.
- CO3 - Apply genetic algorithms bio related real time applications.
- CO4 - Describe swarm intelligence and ant colony for feature selection.
- CO5 - Apply bio-inspired techniques in image processing.
- CO6 - Identify and implement the techniques in bio related image processing applications.

TEXT / REFERENCE BOOKS

1. Eiben, A.E., Smith, James E, "Introduction to Evolutionary Computing", Springer 2015.
2. Helio J.C. Barbosa, "Ant Colony Optimization - Techniques and Applications", Intech 2013.
3. Xin-She Yang, Jao Paulo papa, "Bio-Inspired Computing and Applications in Image Processing", Elsevier 2016
4. Xin-She Yang, "Nature Inspired Optimization Algorithm", Elsevier, 1st Edition, 2014
5. Yang, Cui, Xlao Gandomi, Karamanoglu, "Swarm Intelligence and Bio-Inspired Computing" - Elsevier, 1st Edition 2013.

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**

SCSB7013	WEB ENGINEERING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the characteristics and requirements to create the electronic documents
- To classify the various architectures, design and testing process in web applications
- To be familiar with the testing techniques for web applications

UNIT 1 INTRODUCTION TO WEB ENGINEERING AND REQUIREMENTS ENGINEERING 9 Hrs.

Motivation - Categories of Web Applications - Characteristics of Web Applications - Product-related Characteristics - Usage related Characteristics - Development-related Characteristic - Evolution of web engineering - Requirements Engineering Activities RE Specifics in Web Engineering - Principles for RE of Web Applications - Adapting RE Methods to Web Application Development - Requirement Types - Notations - Tools.

UNIT 2 WEB APPLICATION ARCHITECTURES & MODELLING WEB APPLICATIONS 9 Hrs.

Introduction- Categorizing Architectures - Specifics of Web Application Architectures - Components of a Generic Web Application Architecture - Layered Architectures - Data-aspect Architectures - Database-centric Architectures - Architectures for Web Document Management - Architectures for Multimedia Data Modeling Specifics in Web Engineering - Levels - Aspects - Phases Customization - Modeling Requirements - Hypertext Modeling - Hypertext Structure Modeling Concepts - Access Modeling Concepts - Relation to Content Modeling - Presentation Modeling - Relation to Hypertext Modeling - Customization Modeling - Relation to Content - Hypertext - and Presentation Modeling

UNIT 3 WEB APPLICATION DESIGN 9 Hrs.

Design for Web Apps- Goals-Design Process-Interactive Design- Principles and Guidelines- Workflow- Preliminaries-Design Steps- Usability- Issues- Information Design- Information Architecture- structuring- Accessing Information-Navigation Design- Functional Design-Web app Functionality- Design Process- Functional Architecture- Detailed Functional Design.

UNIT 4 TESTING WEB APPLICATIONS 9 Hrs.

Introduction - Fundamentals - Terminology - Quality Characteristics - Test Objectives - Test Levels - Role of the Tester - Test Specifics in Web Engineering - Test Approaches - Conventional Approaches - Agile Approaches - Test Scheme - Three Test Dimensions - Applying the Scheme to Web Applications - Test Methods and Techniques - Link Testing - Browser Testing - Usability Testing - Load - Stress - and Continuous Testing - Testing Security - Test-driven Development - Test Automation - Benefits and Drawbacks of Automated Test - Test Tools.

UNIT 5 WEB PROJECT MANAGEMENT 9 Hrs.

Understanding Scope - Refining Framework Activities - building a Web Team - Managing Risk - developing a Schedule - Managing Quality - Managing Change - Tracking the Project. Introduction to node JS - web sockets.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Apply the characteristics of web applications.

CO2 - Classify and implement the various architectures in applications.

CO3 - Design and implement the web applications for various environment.

CO4 - Describe the various testing methods.

CO5 - Comprehend the Scope, refining framework activities and quality of the web project management

CO6 - Implement the various techniques in real time applications.

TEXT / REFERENCE BOOKS

1. Gerti Kappel, Birgit Proll, "Web Engineering", John Wiley and Sons Ltd - .
2. Roger S. Pressman, David Lowe, "Web Engineering", Tata McGraw Hill Publication - 2007.
3. Guy W. Lecky-Thompson, "Web Programming", Cengage Learning, 2008.
4. Chris Bates, "Web Programming: Building Internet Applications", 3rd Edition, Wiley India Edition - 2007.
5. John Paul Mueller, "Web Development with Microsoft Visual Studio 2005", Wiley Dream tech, 2006.

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

SCSB7015	DATA COMPRESSION AND TECHNIQUES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the compression techniques and modeling of the compression.
- To expose the coding techniques in compression.
- To .classify the various compression techniques in different applications.

UNIT 1 INTRODUCTION

9 Hrs.

Introduction- Types of Compression- Compression Techniques- Lossless Compression- Lossy Compression – Measures of Performance- Modeling and coding- Models: Physical models - Probability models - Markov models - composite source model - Coding: uniquely decodable codes - Prefix codes.

UNIT 2 HUFFMAN CODING

9 Hrs.

Minimum variance Huffman code- Extended Huffman code- Adaptive Huffman code -Encoding procedure- Decoding procedure- Golomb codes- Rice codes- Tunstall codes- Applications of Huffman Coding-Loss less image compression- Text Compression- Audio Compression.

UNIT 3 CODING

9 Hrs.

Coding a sequence - generating a binary code - Comparison of Binary and Huffman coding - Dictionary Techniques Static Dictionary Diagram Coding Adaptive Dictionary The LZ77 Approach The LZ78 Approach Applications File Compression —UNIX compress Image Compression—The Graphics Interchange Format (GIF) Image Compression—Portable Network Graphics (PNG).

UNIT 4 PREDICTIVE CODING

9 Hrs.

Predictive Coding: Prediction with Partial match (ppm): The basic algorithm - The ESCAPE SYMBOL - Length of context - The Exclusion Principle - The Burrows -Wheeler Transform: Move -to -front coding Lossless Image Compression CALIC - JPEG-LS - Multi-resolution Approaches Facsimile Encoding Dynamic Markov Compression.

UNIT 5 VECTOR QUANTIZATION

9 Hrs.

What is vector Quantization-Advantages of Vector Quantization over Scalar Quantization -The Linde - Buzo - Gray Algorithm - Initializing the LBG Algorithm- The Empty Cell Problem -Use of LBG for Image Compression- Tree-Structured Vector Quantizers - Design of Tree-Structured Vector Quantizers- Pruned Tree-Structured Vector Quantizers -Structured Vector Quantizers -Pyramid Vector Quantization- Polar and Spherical Vector Quantizers- Lattice Vector Quantizers.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Comprehend basic foundations of data compression and factual knowledge about existing compression standards.
- CO2** - Analyze coding and compression techniques.
- CO3** - Differentiate modeling and coding aspect of compression.
- CO4** - Explore knowledge in text compression, modern communications, and image compression.
- CO5** - Identify and implement lossy compression through various quantization techniques.
- CO6** - Comprehend the advantages of Vector Quantization

TEXT / REFERENCE BOOKS

1. Mark Nelson, "The Data Compression", Jean Loup Gailly.
2. David Saloman, "Data Compression: The Complete Reference", Springer.
3. Khalid Sayood, "Introduction to Data Compression", Morgan Kaufmann Publishers.
4. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, "An Introduction to Information Retrieval", Cambridge University Press, Cambridge, England.
5. Robert Korfhage, "Information storage and retrieval", WILEY

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**

SCSB7016	WIRELESS SENSOR NETWORKS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To provide awareness about challenges in wireless sensor networks.
- To acquire knowledge of various networking sensors.
- 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.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Comprehend the basic architecture of the networks
- CO2** - Identify the various strategies of Mac Layer.
- CO3** - Comprehend the node localization,GPS range and data gathering.
- CO4** - Grasp the routing and distributed computation.
- CO5** - Explore the Sensor network tools.
- CO6** - Apply the tools of networks in different attacks.

TEXT / REFERENCE BOOKS

1. Feng Zhao and Leonidas J 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

SCSB7017	ADVANCED COMPUTATIONAL GAME THEORY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To provide background in the area of computational game theory.
- To figure out the basic concepts of the computational theory.
- To experience the mixed strategies of computational theory.

UNIT 1 PREFERENCES - UTILITY - AND GOALS

9 Hrs.

Preference relations and their interpretation - utility as a numeric model of preference - Decision-making under uncertainty: preferences over lotteries; von Neumann and Morgenstern utility functions; expected utility and expected utility maximization- Paradoxes of expected utility maximization; framing effects and prospect theory- Compact representations for preference relations (e.g. - CP-NETS)-Dichotomous preferences and goals. Representations for specifying goals (e.g. - weighted formula representations for combinatorial domains); expressiveness and computational issues.

UNIT 2 THE BASIC MODEL SOLUTION CONCEPTS

9 Hrs.

Pure strategy Nash equilibrium; dominant strategies - notable coordination games and focal points; complexity of pure strategy Nash equilibrium. Measuring social welfare utilitarian social welfare; egalitarian social welfare. Mixed strategies; Nash's theorem -Nash equilibrium. Computing mixed strategy Nash equilibria: The Lemke-Howson algorithm. Zero sum games the Minimax Theorem. Compact representations for strategic form games Boolean games congestion games.

UNIT 3 MIXED STRATEGIES

9 Hrs.

Nash's theorem and Nash equilibrium - Computing mixed strategy Nash equilibria - Lemke-Howson algorithm - Zero sum games - Minimax Theorem - Compact representations for strategic form games - Boolean games - congestion games - Iterated Games. Finitely repeated games and backward induction - infinitely repeated games - measuring utility over infinite plays modelling strategies as finite state machines with output (Moore machines).

UNIT 4 EXTENSIVE FORM NON-COOPERATIVE GAMES

9 Hrs.

Zermelo's algorithm and backward induction - subgame perfect equilibrium - Zermelo's theorem - Compact representations for extensive form games - PEEK games and EXPTIME-completeness results - the Game Description Language (GDL) - Imperfect information games - PEEK games with incomplete information - Cooperative Games.

UNIT 5 SOCIAL CHOICE

9 Hrs.

Social choice and social welfare functions- Condorcet's paradox- desirable properties of social choice procedures (Pareto condition - independence of irrelevant alternatives)- popular voting procedures (Borda - etc)- Arrow's theorem- strategic manipulation of voting procedures and associated impossibility results (Gibbard-Satterthwaite theorem)-complexity of manipulation for voting protocols.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Apply the fundamentals like Nash equilibrium, dominant strategies in the applications.

CO2 - Basic understanding of the Co-operative games and iterated games.

CO3 - Comprehension of non-co-operative games, Zermelo's algorithm and their applications.

CO4 - Able to know the social welfare functions and voting protocols.

CO5 - Gain the ability to implement mixed strategies in the games.

CO6 - Apply in the Social Activities.

TEXT / REFERENCE BOOKS

1. G. Chalkiadakis, E. Elkind, and M Wooldridge, "Computational Aspects of Cooperative Game Theory", Morgan, Claypool, 2011.
2. Machler, E. Solan, S. Zamir, "Game Theory", Cambridge U.P., 2013.
3. M. J. Osborne - An Introduction to Game Theory - Oxford U.P. - 2004.
4. R. D. Luce and H. Raiffa, "Games and Decisions", Wiley, 1958
5. M. Machler, E. Solan, S. Zamir, "Game Theory", Cambridge U.P., 2013 (Excellent contemporary text on game theory that combines rigour with readability).
6. M. J. Osborne and A. Rubinstein, "A Course in Game Theory", 1994 (Mathematically rigorous text. Available online: <https://books.osborne.economics.utoronto.ca/>)
7. M. J. Osborne, "An Introduction to Game Theory", Oxford U.P., 2004 (A somewhat lighter companion to Osborne and Rubinstein's 'A Course in Game Theory').

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

SCSB7019	QUANTUM CRYPTOGRAPHY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To figure out the quantum computation techniques.
- To expose the Measurement and Linear transformation.
- To explore the Quantum Applications.

UNIT 1 INTRODUCTION

9 Hrs.

History of quantum computation and quantum information- Classical cryptography-Confidentiality and secret-key Ciphers-Secret- key Authentication-Public-key cryptography- Quantum bits and computation- Single qubit gates - Multiple qubit gates- Quantum circuits - Qubit copying circuit- Bell states - quantum teleportation.

UNIT 2 MEASUREMENT OF MULTIPLE-QUBIT STATES

9 Hrs.

Dirac's BrackKet Notation for Linear Transformations - Projection Operators for Measurement - Hermitian Operator Formalism for Measurement - The Measurement Postulate - EPR Paradox and Bell's Theorem - Setup for Bell's Theorem - Bell's Inequality

UNIT 3 QUANTUM STATE TRANSFORMATIONS

9 Hrs.

Unitary Transformations- Some Simple Quantum Gates- Applications of Simple Gates- Realizing Unitary Transformations as Quantum Circuits- Quantum Versions of Classical Computations- From Reversible Classical Computations to Quantum Computations- Reversible Implementations of Classical Circuits.

UNIT 4 INTRODUCTION TO QUANTUM ALGORITHMS

9 Hrs.

Computing with Superposition- Notions of Complexity- Deutsch's Problem- Quantum Subroutines - Bernstein-Vazirani Problem- Simon's Problem - Distributed Computation- Classical Fourier Transform- Quantum Fourier Transform

UNIT 5 ALGORITHMS

9 Hrs.

Classical Reduction to Period-Finding- Shor's Factoring Algorithm- Example Illustrating Shor's Algorithm- The Efficiency of Shor's Algorithm- Omitting the Internal Measurement- Generalizations- Grover's Algorithm- Amplitude Amplification -Optimality of Grover's Algorithm- DE randomization of Grover's Algorithm and Amplitude Amplification- Practical Implications of Grover's Algorithm and Amplitude Amplification.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the this course, the student can able to

CO1 - Learn the fundamentals of the quantum Computation

CO2 - Recognize to apply measurements and Multiple states in various applications. **CO3** -

Explore the Quantum applications and transformations in various computations. **CO4** -

Implement the algorithms in the different environments.

CO5 - Explain the Grover's algorithm

CO6 - Identify and apply the various algorithms in the different environments.

TEXT / REFERENCE BOOKS

1. Eleanor Rieffel and Wolfgang Polak, "Quantum Computing, A Gentle Introduction", MIT Press, 2014.
2. Michael A. Nielsen & Isaac L. Chu, "Quantum Computation and Quantum Information", Cambridge University Press, 2011.
3. Arthur O Pittenger, "An Introduction to Quantum Computing Algorithms", Birkhäuser, 2003.
4. Gilles van Assche "Quantum Cryptography and Secret key Dist", Cambridge University Press, 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**

SCSB7024	ADVANCED DATA ACQUISITION AND VISUALIZATION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To recognize fundamentals of the data acquisition.
- To classify the various types of the acquisition system and signals in the applications.
- To acquire the knowledge about the data visualization techniques.

UNIT 1 DATA ACQUISITION

9 Hrs.

Introduction-Need of Data Acquisition- Application of Data Acquisition- Principles of Data Acquisition Systems- Data Acquisition System Components- Data Acquisition Systems Measurements - Modules & Methods- Data Acquisition Tools-ActiveX - DATAQ.

UNIT 2 DATA ACQUISITION SYSTEMS AND DATA ACQUISITION SIGNALS

9 Hrs.

Types of Data Acquisition Systems- Data Loggers- Data Acquisition Devices- Modular Data Acquisition Systems- Data Acquisition Signal Capturing Used by DAQ Systems- Voltage Signals- Current Signals- Power Signals- Applications and Benefits of Data Acquisition Systems- Modulation and sampling- Digitization and coding- File formats.

UNIT 3 DATA VISUALIZATION

9 Hrs.

Acquiring and Visualizing Data - Simultaneous acquisition and visualization - Applications of Data Visualization - Keys factors of Data Visualization -Exploring the Visual Data Spectrum: charting Primitives Data Points - Line Charts - Bar Charts - Pie Charts - Area Charts - exploring advanced Visualizations - Making use of HTML5 CANVAS - Integrating SVG.

UNIT 4 BASICS OF DATA VISUALIZATION

9 Hrs.

Tables: Reading Data from Standard text files (.txt - .csv - XML) - Displaying JSON content Outputting Basic Table Data (Building a table - Using Semantic Table - Configuring the columns) - Assuring Maximum readability (Styling your table - increasing readability - adding dynamic Highlighting) - Including computations - using data tables library - relating data table to a chart.

UNIT 5 ADVANCED DATA VISUALIZATION

9 Hrs.

Making charts interactive and Animated: Data joins - updates and exits - interactive buttons - Updating charts - adding transactions - using keys Adding a Play Button - wrapping the update phase in a function - adding a Play button to the page - Making the Play button go - Allow the user to interrupt the play - sequence- Dashboard design issues and assessment of needs - Considerations for designing dashboard-visual perception - achieving eloquence- Designing Bullet Graphs.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Knowledge about the fundamental need of data acquisition.

CO2 - Figure out types of devices used for data acquisition. **CO3** - Acquire the basics of knowledge of exploring the data. **CO4** - Grasp the data visualization techniques.

CO5 - Gain the ability to make charts with interactive buttons and play buttons in various applications.

CO6 - Implement the animation techniques, visualizations in applications.

TEXT / REFERENCE BOOKS

1. Jon Raasch, Graham Murray, Vadim Ogievetsky, Joseph Lowery, "JavaScript and jQuery for Data Analysis and Visualization", WROX
2. Ritchie S. King, "Visual story telling with D3", Pearson.
3. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.
4. A Julie Steele and Noah Iliinsky, "Designing Data Visualizations: Representing Informational Relationships", O'Reilly.
5. Andy Kirk, "Data Visualization: A Successful Design Process", PAKT.
6. Scott Murray, "Interactive Data Visualization for Web", O'Reilly.
7. Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.
8. Tamara Munzner, "Visualization Analysis and Design", AK Peters Visualization Series, CRC Press, Nov. 2014.

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**

SCSB7025	SYSTEM SECURITY AND PRACTICES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn the core fundamentals of system and web security concepts.
- To have through understanding in the security concepts related to networks.
- To perform a detailed study of Privacy and Storage security and related Issues.

UNIT I SYSTEM SECURITY

9 Hrs.

Building a secure organization- A Cryptography primer- detecting system Intrusion Preventing System Intrusion- Fault tolerance and Resilience in cloud computing environments- Security web applications - services and servers.

UNIT 2 NETWORK SECURITY

9 Hrs.

Internet Security - Botnet Problem- Intranet security- Local Area Network Security -Wireless Network Security - Wireless Sensor Network Security- Cellular Network Security - Optical Network Security- Optical Wireless Security.

UNIT 3 SECURITY MANAGEMENT

9 Hrs.

Information security essentials for IT Managers- Security Management System – Policy Driven System Management- IT Security - Online Identity and User Management System - Intrusion and Detection and Prevention System.

UNIT 4 CYBER SECURITY AND CRYPTOGRAPHY

9 Hrs.

Cyber Forensics- Cyber Forensics and Incidence Response - Security e-Discovery - Network Forensics - Data Encryption- Satellite Encryption - Password based authenticated Key Establishment Protocols.

UNIT 5 PRIVACY AND STORAGE SECURITY

9 Hrs.

Privacy on the Internet - Privacy Enhancing Technologies - Personal Privacy Policies - Detection of Conflicts in security policies- privacy and security in environment monitoring Systems. Storage Area Network Security - Storage Area Network Security Devices – Risk Management - Physical Security Essentials.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Experience the cryptography, system intrusion and fault tolerance.
- CO2 - Figure out Network security concepts.
- CO3 - Learn the how to manage the security issues.
- CO4 - Implement the algorithms of cyber security.
- CO5 - Recognize the privacy policy of data storage security.
- CO6 - Gain knowledge about all policies, privacy of the security in the data.

TEXT / REFERENCE BOOKS

1. John R.Vacca, "Computer and Information Security Handbook", 2nd Edition, Elsevier 2013.
2. Michael E. Whitman, Herbert J. Mattord," Principal of Information Security", 4th Edition, Cengage Learning,2012.
3. Richard E.Smith," Elementary Information Security", 2nd Edition, Jones and Bartlett Learning, 2016.

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**

SCSB7026	DATA SCIENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To recognize the basics of data science.
- To get knowledge in analytical methods.
- To know the packages of python for data science.

UNIT 1 INTRODUCTION TO DATA SCIENCE

9 Hrs.

Big Data and Data Science Hype–Characteristics of Big Data– Data Science Life Cycle–Statistical Methods–Probability–Sampling and Sampling Distributions–Statistical Inference–Prediction and Prediction Error–Resampling.

UNIT 2 ANALYTICAL THEORY AND METHODS

9 Hrs.

Linear Discriminant Analysis–Bayesian Methods –Introduction to Clustering Techniques –K means– Gaussian Mixture Models and Expectations – Maximization – agglomerative clustering – evaluation of clustering – Rand index – mutual information-based scores – Fowlkes – Mallows index – Ensemble Techniques – Bagging & Boosting.

UNIT 3 DATA SCIENCE USING PYTHON

9 Hrs.

Data science packages–NumPy Basics-Pandas-Data Loading–Data Wrangling-Plotting and Visualization–Data Aggregation and Group Operations – Data Exploration – Visualization using python.

UNIT 4 INTRODUCING R LANGUAGE

9 Hrs.

R Basics-R Objects–R Notations– Packages – Indexing Data– Loading Data – Exploratory Data Analysis using R– Statistical Methods for Evaluation using R – Data Science applications–Time Series Forecasting - Text Mining & Sentiment Analysis

UNIT 5 DATA VISUALIZATION

9 Hrs.

Data Visualization: Basic Principles– Categorical and Continuous Variables – Exploratory Graphical Analysis – Creating Static Graphs– Animated Visualizations – Loops - GIFs and Videos.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, the students will be able to

CO1 - Figure out the basics needs of data science. **CO2** -

Acquire knowledge of various analytical methods. **CO3** -

Work with data science packages of python.

CO4 - Apply data science algorithms using R language.

CO5 - Implement various visualization techniques.

CO6 - Identify and apply the Data science tools in the real time applications

TEXT / REFERENCE BOOKS

1. Wes McKinney, "Python for Data Analysis", O'Reilly Media, 2012
2. Garrett Golemund, "Hands on programming with R", O'Reilly, 2014
3. Cathy O'Neil and Rachel Schutt, "Doing Data Science - Straight Talk from The Frontline", O'Reilly. 2014.
4. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, "An introduction to statistical learning with application in R", Springer.

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**

SCSB7027	IMAGE PROCESSING AND ANALYSIS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To comprehend fundamental of image processing and various image models
- To recognize frequency domain filters
- To study different types of segmentation algorithms

UNIT 1 IMAGE MODELS AND PROCESSING

9 Hrs.

Introduction to image processing – imaging modalities – image file formats – image sensing and acquisition – image sampling and quantization – noise models – spatial filtering operations – histograms – smoothing filters – sharpening filters – fuzzy techniques for spatial filtering – spatial filters for noise removal - Color models – pseudo colors – color transformations

UNIT 2 IMAGE ENHANCEMENT IN SPATIAL DOMAIN

9 Hrs.

Basic gray level transformations - histogram processing - enhancement using logical and arithmetic operations - basic spatial filtering - smoothing and sharpening spatial filters. Combining spatial enhancement methods. Smoothing frequency domain filters - sharpening frequency domain filters homomorphic filtering.

UNIT 3 THRESHOLDING TECHNIQUES AND EDGE DETECTION

9 Hrs.

Thresholding techniques – region growing methods – region splitting and merging – adaptive thresholding – threshold selection – global valley – histogram concavity – edge detection – template matching – gradient operators – circular operators – differential edge operators – hysteresis thresholding – Canny operator – Laplacian operator – active contours – Level set and Graph cut approaches to object segmentation.

UNIT 4 IMAGE ANALYSIS

9Hrs.

Feature extraction – reduction – Image retrieval and its performance – Syntax and introduction to semantic based retrieval – introduction to watermarking – steganography –Image Compression – redundancy in images – coding redundancy – irrelevant information in images – image compression models – basic compression methods – Introduction to compression standards

UNIT APPLICATIONS IN IMAGE PROCESSING

9 Hrs.

Case Study: Pattern Recognition - Iris Recognition - Face recognition and Biomedical Applications.

Max .45 Hrs.

COURSE OUTCOMES

On the completion of the course, the students will be able to

CO1 - Distinguish the image enhancement in spatial domain and color transformation.

CO2 - Apply the frequency domain filters to enhance the images.

CO3 - Identify and apply the image segmentation and edge detection techniques in image processing applications.

CO4 - Implement feature extraction and Image retrieval.

CO5 - Harness image processing techniques in various applications

CO6 - Learn about the image processing techniques in different applications.

TEXT / REFERENCE BOOKS

1. Rafael Gonzalez and Richard Woods, "Digital Image Processing", 3rd edition, Pearson Publications, 2017.
2. Anil K. Jain, "Fundamental of Digital Image Processing", PHI publication, 1988.

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**

SCSB7028	DEEP LEARNING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To develop and Train Deep Neural Networks.
- To understand a Neural Networks concepts.
- To learn and apply the convolutional Networks concepts in various applications.

UNIT 1 DEEP NETWORKS

9 Hrs.

Machine Learning Basics: Learning Algorithms – Supervised and Unsupervised learning – Feed forward Deep networks – Regularization: Regularization and Under-Constrained Problems - Dataset Augmentation – Early stopping. Optimization for training Deep models: Learning vs Optimization – Challenges – Basic Algorithms: Stochastic Gradient Descent - Adam - Conjugate Gradient method

UNIT 2 NEURAL NETWORKS

9 Hrs.

About Neural Network. Building Blocks of Neural Network. Optimizers. Activation Functions. Loss Functions - Data Pre-processing for neural networks - Feature Engineering - Over fitting and Under fitting - Hyper parameters.

UNIT 3 CONVOLUTIONAL NETWORKS AND SEQUENCE MODELLING

9 Hrs.

Convolutional Networks – Convolution operation – Motivation Pooling – Basic Convolution function – Algorithms – Recurrent and recursive nets : Recurrent neural networks – Bidirectional RNN – Recursive Neural networks – Auto regressive networks – introduction to Long term dependencies and Temporal dependencies.

UNIT 4 NATURAL LANGUAGE PROCESSING USING RNN

9 Hrs.

Language Modeling . Vector Space Model (VSM). Continuous Bag of Words (CBOW). Skip-Gram Model for Word Embedding. Part of Speech (PoS) Global Co-occurrence Statistics–based Word Vectors. Transfer Learning. Word2Vec. Global Vectors for Word Representation GloVe. Back propagation Through Time.

UNIT 5 APPLICATIONS

9 Hrs.

Speech - Audio and Music processing – Language modeling and Natural language processing – Information Retrieval – Object Recognition and Computer Vision – Multi modal and multi task learning.

Max.45Hrs.

COURSE OUTCOMES

On completion of the course, the students will be able to

CO1 - Recognize fundamentals of concepts of machine learning. **CO2** -

Apply the neural networks concepts in different environments. **CO3** -

Work with convolutional networks and modeling tools.

CO4 - Recognize fundamentals and methods of Natural Language Processing.

CO5 - Appreciate the applications of speech audio and video processing.

CO6 - Implement the deep learning techniques in various real time applications.

REFERENCE BOOKS

1. Yoshua Bengio and Ian J. Goodfellow and Aaron Courville, "Deep Learning", MIT Press, 2015.
2. Li Deng, Dong Yu, "Deep Learning: Methods and Applications", Now Publis.

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**

SCSB7029	RECONFIGURABLE COMPUTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To recognize the Basic performance of RC devices.
- To comprehend the architecture of the of RC devices.
- To figure out the future generation of the computing.

UNIT 1 GENERAL OVERVIEW

9 Hrs.

General overview - Goals and motivations - History - state of the art - future trends -Basic RC concepts and related fields of study - Performance - power - size - and other metrics

UNIT 2 RC DEVICES AND ARCHITECTURES

9 Hrs.

FPGAs in general Xilinx Zynq 7000 family programmable SOC (system on chip) in particular - hybrid device with ARM + FPGA architecture -RC architectures in general - Zed Board platform Zynq- 7000 All Programmable SoC XC7Z020 -CLG484-1 Other key components in more detail - Novo-G reconfigurable supercomputer GiDEL board - Other RC platforms Amazon EC2 F1 Instances Microsoft Catapult

UNIT 3 DESIGN TOOLS AND LANGUAGES

9 Hrs.

Hardware description languages - review VHDL - Xilinx Vivad Synthesis - PAR - simulation - debug tools High-level synthesis (HLS) languages and tools OpenCL - Convey Hybrid Threading Tools - C- to-gates languages

UNIT 4 RC APPLICATION DEVELOPMENT

9 Hrs.

Compute models and system architectures: parallelism - systolic arrays - pipelining - optimizations - bottlenecks RC application domains and case studies BioRC (computational biology) - FinRC (computational finance) - DSP (signal and image processing) - Hardware/software partitioning - numerical analysis - performance analysis and prediction - etc.

UNIT 5 SPECIAL TOPICS

9 Hrs.

RC - BioRC - FinRC - DSP projects - Behavioral emulation of future-generation computing systems - High-level synthesis (HLS) development & studies - Hybrid Memory Cube (HMC) in RC - Device and app characterization - Partial reconfiguration

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, the student will be able to **CO1** -

Acquire knowledge about reconfigurable computing. **CO2** -

Figure out the architecture and devices of RC.

CO3 - Ability to implement design tools and languages in hardware description.

CO4 - Comprehend the application of reconfigurable computing.

CO5 - Learn the future generation computing systems.

CO6 - Implement the tools to develop various projects.

TEXT / REFERENCE BOOKS

1. Scott Hauck and Andre DeHon, "Reconfigurable Computing: The Theory and Practice of FPGA- Based Computation", Elsevier - Inc. (Morgan Kaufmann Publishers) - Amsterdam - 2008. ISBN: 978-0-12-370522-8.
2. C. Maxfield, "The Design Warrior's Guide to FPGAs", Newnes, 2004, ISBN: 978-0750676045.

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**

SCSB7030	SOFTWARE DEFINED NETWORKING AND NETWORK FUNCTIONS VIRTUALIZATION FOR IOT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To comprehend the use of Modern Network approaches
- To apply data center topologies in virtualized environment
- To know various components for building an IoT application

UNIT 1 MODERN NETWORKING

9 Hrs.

Internet of Things - Types of Network and Internet Traffic - Demand: Big Data - Cloud Computing - and Mobile Traffic - Requirements: QoS and QoE – Routing Congestion Control

UNIT 2 SOFTWARE DEFINED NETWORKS

9 Hrs.

Network Requirements - The SDN Approach - SDN- and NFV-Related Standards – SDN Data Plane - OpenFlow Logical Network Device - OpenFlow Protocol - SDN Control Plane Architecture - REST API - SDN Application Plane Architecture

UNIT 3 VIRTUALIZATION

9 Hrs.

Background and Motivation for NFV - Virtual Machines - NFV Concepts – NFV Reference Architecture - NFV Infrastructure - Virtualized Network Functions – NFV Management and Orchestration - NFV Use Cases - SDN and NFV

UNIT 4 THE INTERNET OF THINGS: COMPONENTS

9 Hrs.

The IoT Era - Scope of the Internet of Things - Components of IoT-Enabled Things – IoT World Forum Reference Model - ITU-T IoT Reference Model - IoTivity - Cisco IoT System-IoBridge - SDN and NFV over IoT Deployment

UNIT 5 SECURITY

9 Hrs.

Security Requirements - SDN Security - NFV Security - ETSI Security Perspective – IoT Security - The Patching Vulnerability - IoT Security and Privacy Requirements Defined by ITU-T - An IoT Security Framework - The Impact of the New Networking on IT Careers.

Case Study: A study about Defense for all security SDN application.

Max.45 Hrs.

COURSE OUTCOMES

On completion of this course, the students will be able to

CO1 - Recognize the use of Modern Network approaches.

CO2 - Figure out how to apply data center topologies in virtualized environment.

CO3 - Know the various Virtualization Techniques in various projects.

CO4 - Learn the components of IoT

CO5 - Comprehend the security requirements of SDN Security and NFV security.

CO6 - Identify the appropriate security features for the SDN and NFV in various real time environments.

TEXT / REFERENCE BOOKS

1. William Stallings, "Foundations of Modern Networking: SDN - NFV - QoE - IoT - and Cloud", Pearson Education, 2015.
2. Jim Doherty, "SDN and NFV Simplified: A Visual Guide to Understanding Software Defined Networks and Network Function Virtualization", 1st Edition, Pearson Education, 2016.
3. Paresh Shah, Syed Farrukh Hassan, Rajendra Chayapathi, "Network Function virtualization with a touch of SDN", Addison-Wesley, Pearson Education, 2016.

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

SCSB7031	DIGITAL STEGANOGRAPHY AND WATERMARKING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To figure out the basic principles and different types of steganography techniques.
- To make them understand the steganalysis, techniques to apply in research projects.
- To provide the basic knowledge of various methods in watermarking techniques.

UNIT 1 INTRODUCTION

9 Hrs.

Introduction to Information hiding – Brief history and applications of information hiding -Principles of Steganography – Frameworks for secret communication – Security of Steganography systems – Information hiding in noisy data – Adaptive versus non-Adaptive Algorithms – Active and Malicious Attackers – Information hiding in written - Examples of Invisible communications.

UNIT 2 STENOGRAPHIC TECHNIQUES

9 Hrs.

Stenographic techniques – Substitution system and bit plane tools – Transform domain techniques – Spread spectrum and information hiding – Statistical Steganography – Distortion and cover generation techniques.

UNIT 3 STEGANALYSIS

9 Hrs.

Overview of steganalysis- Statistical Properties of Images - Visual Steganalytic System –IQM Based Steganalytic System - Learning Strategies - Frequency-Domain Steganalytic System - Looking for Signatures: Detecting Hidden Information - Extracting Hidden Information -Disabling Hidden Information

UNIT 4 WATERMARKING

9 Hrs.

Introduction -History and Terminology - Basic Watermarking Principles - Watermark Watermark Recovery with or without the Original Data - Watermark Extraction or Verification of Presence for a Given Watermark - Watermark Security and Keys - Evaluation and Benchmarking of Watermarking Systems

UNIT 5 CRYPTOGRAPHIC AND PSYCHO VISUAL ASPECTS

9 Hrs.

Cryptographic and psycho visual aspects – Choice of a workspace – Formatting the watermark bits – Merging the watermark and the cover – Optimization of the watermark receiver –Extension from still images to video- Fingerprinting: Introduction – Examples - Terminology and Requirements - Classification - Research History - Schemes - Digital Copyright and Watermarking- Conflict of Copyright Laws on the Internet

Max.45Hrs.

COURSE OUTCOMES

On completion of this course, the students will be able to

CO1 - Recognize the skill to make and implement a simple Steganographic technique.

CO2 - Distinguish between Watermarking and Steganography techniques.

CO3 - Implement suitable steganography method to develop a new project.

CO4 - Understand the existing digital watermarking techniques and formulate new ideas

CO5 - Learn about the cryptographic and psycho visual aspects - finger printing

CO6 - Have a detailed knowledge of the watermarking techniques and steganographic techniques in research projects.

TEXT / REFERENCE BOOKS

1. Stefan Katzenbelsser and Fabien A. P. Petitcolas , “Information Hiding Techniques for Steganography and Digital Watermarking”, Artech House Publishers, 2004.
2. Frank Y. Shih, “Digital Watermarking and Steganography: fundamentals and techniques”, CRC Press, 2007.
3. Jessica Fridrich, “Steganography in Digital Media: Principles - Algorithms - and Applications”, Cambridge University Press, 2010.
4. Abbas Cheddad, Vdm Verlag and Dr. Muller, “Digital Image Steganography: Concepts - Algorithms and Applications”, Aktienge sells Chافت & Co. Kg, 2009.
5. Ingemar Cox, Matthew Miller, Jeffrey Bloom, Jessica Fridrich and Ton Kalker , “Digital Watermarking and Steganography”, Morgan Kaufmann Publishers, 2007.

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**

SCSB7032	SPEECH AND AUDIO SIGNAL PROCESSING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To recognize the basic mechanism of speech production.
- To learn the basic concepts of time and frequency domain analysis of speech signal.
- To explain the various parametric representation of speech processing.

UNIT 1 SPEECH PRODUCTION

9 Hrs.

Mechanism of speech production - Acoustic phonetics - Digital models for speech signals - Representations of speech waveform: Sampling speech signals - basics of quantization - delta modulation - and Differential PCM - Auditory perception: psycho acoustics.

UNIT 2 TIME DOMAIN ANALYSIS

9 Hrs.

Time domain analysis of Speech signal – Methods for extracting the parameters Energy - Average Magnitude - Zero crossing Rate – Silence Discrimination using ZCR and energy – Short Time Auto Correlation Function – Pitch period estimation using Auto Correlation Function.

UNIT 3 FREQUENCY DOMAIN ANALYSIS

9 Hrs.

Sampling rates – Filter banks - Spectrogram - Pitch and formant extraction - Homomorphic speech processing: Cepstral analysis of Speech - Formant and Pitch Estimation - Audio compression methods and standards - Chroma features - PNCC - LSF - LAR - Sonogram - Tempogram.

UNIT 4 PARAMETRIC REPRESENTATION OF SPEECH

9 Hrs.

Basic Principles of linear predictive analysis – Auto correlation method – Covariance method – Solution of LPC equations – Cholesky method – Durbin's Recursive algorithm – Application of LPC parameters – Pitch detection using LPC parameters – Formant analysis – VELP – CELP - PLP and MFCC Coefficients.

UNIT 5 CASE STUDY

9 Hrs.

Automatic speech recognition – Text dependent and text independent speaker identification and verification – Speech synthesis – Audio segmentation – Music classification and information retrieval – Music emotion recognition.

Max.45Hrs.

COURSE OUTCOMES

On completion of this course, the students will be able to

- CO1** - Acquired knowledge of speech mechanism and auditory perception in speech processing.
- CO2** - Recognize the time and frequency domain analysis of speech.
- CO3** - Learn various parameters like filtering techniques, extraction of speech modulation.
- CO4** - Ability to develop systems for various applications of speech processing.
- CO5** - Comprehend the automatic speech recognition.
- CO6** - Implement the speech techniques in the real time applications.

TEXT / REFERENCE BOOKS

1. L. R. Rabiner and R. W. Schaffer, "Digital Processing of Speech signals", Prentice Hall.
2. Ben Gold and Nelson Morganm "Speech and Audio Signal Processing - Processing and Perception of Speech and Music", Wiley, India Edition, 2006.
3. Thomas F Quatieri, "Discrete-Time Speech Signal Processing – Principles and Practice", Pearson Education, 2004.
4. Lawrence Rabiner and Biing-Hwang Juang, "Fundamentals of Speech Recognition", Pearson Education, 2003.
5. Daniel Jurafsky and James H Martin, "Speech and Language Processing, An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Pearson Education, 2002.
6. Meinard Muller, "Fundamentals of Music Processing – Audio, Analysis, Algorithms, Applications", Springer International Publishing, 2015.

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**

SCSB7033	IMAGE MINING AND REPOSITORY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To recognize the fundamentals of image retrieval and image databases.
- To introduce different features and extraction methods in image mining.
- To explain the various clustering and classification techniques in image mining.

UNIT 1 INTRODUCTION

9 Hrs.

Annotation based image retrieval - Content Based Image Retrieval (CBIR): CBIR architectures - Region-based retrieval - Semantic-based retrieval - Context-based retrieval - Relevance Feedback. Types of image databases; Image Features. Image Clustering - Classification - Matching - Indexing.

UNIT 2 IMAGE DATA BASE

9 Hrs.

Structured image databases - textured image database - image properties - Feature vector database - Image Features: colour based - colour models - texture based - shape based - spatial orientation. Edge and boundary based features.

UNIT 3 STATISTICAL METHODS

9 Hrs.

Statistical methods: mean - variance - covariance - coefficient of variation - mean vector - covariancematrix - correlation - regression - co-occurrence matrix - Eigen vector. Histogram bins

UNIT 4 CLUSTERING

9 Hrs.

Clustering: k-means algorithm - c-means algorithm - fuzzy c-means - kNN method - Branch and Bound method - Graph theoretic approach. Classification: Bayes classifier - Quadratic classifier.

UNIT 5 POINT-WISE MEASURES

9 Hrs.

Point-wise measures: Euclidean distance - Manhattan distance - Canberra distance; Distributional measures: Bhattacharyya distance - Mahalanobis distance - Kullback-Liebler distance - Chisquared distance - Chebychev. Measure of performance: Precision - recall; F measures.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Acquire knowledge about various image retrieval techniques.

CO2 - Analyze different image databases and its uses.

CO3 - Classify the different feature sets and its extraction methods.

CO4 - Implement various classification and clustering algorithms in research projects.

CO5 - Comprehend the point-wise measure and distributional measures.

CO6 - Evaluate different distance measures and performance measures.

TEXT / REFERENCE BOOKS

1. Keinosuke Fukunaga, "Introduction to Statistical Pattern Recognition", 2nd Ed., Academic Press Inc., New York, 1990.
2. Oge Marques and Borko Furht, "Content-Based Image and Video Image Retrieval ", Kluwer Academic Publisher, USA, 2002.
3. Sagarmay Deb, "Multimedia Systems and Content-Based Image Retrieval", IDEA Group Publishing, USA, 2004.
4. Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining: Concepts and techniques", 3rd Ed., Elsevier, 2011.

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**

SCSB7034	DIGITAL VIDEO PROCESSING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To provide the students with a basic understanding of the theory behind various video processing tasks.
- To learn the most popular and successful algorithms to solve video processing problems.
- To implement the various video processing techniques in the real world applications.

UNIT 1 HUMAN VISUAL SYSTEM AND COLOR 9 Hrs.

Color Vision and Models - Contrast Sensitivity -Spatiotemporal Frequency Response - Stereo/Depth Perception. Analog Video: Progressive vs. Interlaced Scanning-Analog-Video Signal Formats -Analog- to-Digital Conversion. Digital Video: Spatial Resolution and Frame Rate - Color - Dynamic Range - and Bit-Depth. Digital Video Standards: 3D Video - 3D-Display Technologies - Stereoscopic Video - Multi-View Video. Digital Video Applications.

UNIT 2 MOTION MODELS 9 Hrs.

Estimation Criteria- 2D Apparent-Motion Estimation: Sparse Correspondence -Optical-Flow Estimation - Optical-Flow Equation and Normal Flow-Displaced Frame Difference. Motion Estimation algorithms: Global motion estimation-Block matching-Variable Size Block-Matching - Hierarchical Block-Matching - Phase-Correlation Method. 3D Motion and Structure Estimation: Camera Calibration- Affine Reconstruction- Projective Reconstruction Euclidean Reconstruction

UNIT 3 IMAGE SEGMENTATION 9 Hrs.

Thresholding - Clustering - Bayesian Methods - Graph-Based Methods -Active-Contour Models. Change Detection: Shot-Boundary Detection- Background Subtraction. Motion Segmentation: Dominant-Motion Segmentation- Multiple-Motion Segmentation. Motion Tracking: Graph-Based Spatiotemporal Segmentation and Tracking- Kanade Lucas Tomasi Tracking -Mean-Shift Tracking - Active-Contour Tracking- 2D mesh tracking.

UNIT 4 THEORY OF SPATIO-TEMPORAL FILTERING 9 Hrs.

Frequency Spectrum of Video- Motion-Adaptive Filtering -Motion-Compensated Filtering. Video-Format Conversion: Down-Conversion- De-Interlacing - Frame-Rate Conversion. Multi-Frame Noise Filtering: Motion-Adaptive Noise Filtering Motion-Compensated Noise Filtering. Multi-Frame Restoration: Multi- Frame Modeling- Multi Frame Wiener Restoration

UNIT 5 VIDEO-COMPRESSION APPROACHES 9 Hrs.

Intra-Frame Compression - Motion JPEG 2000 and Digital Cinema- 3D Transform Coding - Motion-Compensated Transform Coding. Early Video Compression Standards: ISO and ITU Standards- MPEG-1 Standard- MPEG-2 Standard-8.3 MPEG-4 AVC/ITU-T H.264 Standard: Input-Video Formats and Data Structure- Intra Prediction -Motion Compensation. High-Efficiency Video-Coding (HEVC) Standard: Video-Input Format and Data Structure – Coding Tree Units.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Comprehend the fundamentals of video processing techniques.

CO2 - Classify the various the video filtering and video compression techniques.

CO3 - Recognize the basic video processing operations using the MATLAB.

CO4 - Demonstrate a complete video processing system to achieve a specific task and analyze and interpret the system.

CO5 - Learn about the intra frame compression and compression standards

CO6 - Implement the video compression techniques in research and real time projects.

TEXT / REFERENCE BOOKS

1. Murat Tekalp A, "Digital Video Processing", 2nd Edition, Prentice Hall, 1995.
2. Bovik AL, "The Essential Guide to Video Processing", Academic Press, 2009.
3. Iain E. G. Richardson, "Video Codec Design", John Wiley and Sons, 2002.
4. Iain E. G. Richardson, "H.264 and MPEG-4 Video Compression: Video Coding for Next Generation Multimedia", Wiley, 2003.
5. Bovik AL, "Handbook of Image and Video Processing", 2nd edition, Academic Press, 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

SCSB7035	FULL STACK WEB APPLICATION DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To comprehend fundamentals of TypeScript language.
- To acquire knowledge about the various languages to develop the web applications
- To classify the various database tools to utilize in the different types of research and real time projects.

UNIT 1 FUNDAMENTALS & TYPESCRIPT LANGUAGE

9 Hrs.

Server-Side Web Applications. Client-Side Web Applications. Single Page Application. About TypeScript. Creating TypeScript Projects. TypeScript Data Types. Variables. Expression and Operators. Functions. OOP in Typescript. Interfaces. Generics. Modules. Enums. Decorators. Enums. Iterators. Generators.

UNIT 2 ANGULAR

9 Hrs.

Introduction to Angular CLI. Creating an Angular Project - Components - Components Interaction. Dynamic Components - Angular Elements - Angular Forms - Template Driven Forms. Property - Style - Class and Event Binding - Two way Bindings. Reactive Forms - Form Group - Form Controls - About Angular Router. Router Configuration. Router State. Navigation Pages. Router Link. Query Parameters. URL matching. Matching Strategies. Services. Dependency Injection.

UNIT 3 NODE.js

9 Hrs.

Introduction to Node.js. Configuring Node.js environment. Node Package Manager NPM. Modules. Asynchronous Programming. Call Stack and Event Loop. Callback functions. Callback errors. Abstracting callbacks. Chaining callbacks. File System. Synchronous vs. asynchronous I/O. Path and directory operations. File Handle. File Synchronous API. File Asynchronous API. File Callback API. Timers. Scheduling Timers. Timers Promises API. Node.js Events. Event Emitter.

UNIT 4 EXPRESS.Js

9 Hrs.

Express.js. How Express.js Works. Configuring Express.js App Settings. Defining Routes. Starting the App. Express.js Application Structure - Configuration - Settings - Middleware - body-parser - cookie- parser - express-session - response-time - Template Engine - Jade - EJS - Parameters - Routing - router - route(path) - Router Class - Request Object - Response Object - Error Handling - RESTful.

UNIT 5 MONGODB

9 Hrs.

Introduction to MongoDB. Documents. Collections. Subcollections. Database. Data Types. Dates. Arrays. Embedded Documents. CRUD Operations. Batch Insert. Insert Validation. Querying The Documents. Cursors. Indexing. Unique Indexes. Sparse Indexes. Special Index and Collection Types. Full-Text Indexes. Geospatial Indexing. Aggregation framework.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Recognize the basic programming skills of Javascript.
- CO2 - Implement a front-end web application using Angular.
- CO3 - Able to create modules to organise the server.
- CO4 - Design the MongoDB database for various applications.
- CO5 - Learn and apply the CRUD operations in MangoDB.
- CO6 - Distinguish the complex and relational data in MongoDB using Mongoose

TEXT / REFERENCE BOOKS

1. Adam Freeman, "Essential TypeScript", Apress, 2019.
2. Mark Clow, "Angular Projects", Apress, 2018.
3. Azat Mardan, "Pro Express.js", Apress, 2015
4. Kyle Banker, Peter Bakkum, Shaun Verch, Douglas Garrett, Tim Hawkins, "MongoDB in Action", Manning Publication, 2016.

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**

SCSB7036	SENSORS AND SENSING TECHNIQUES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To get knowledge on the sensor characteristics and the fundamental principles of sensing
- To learn characteristics of interface electronic circuits
- To get familiar with motion-related sensors.

UNIT 1 PRINCIPLES OF SENSING

9 Hrs.

Data acquisition – Sensor characteristics: Transfer function – Calibration – Accuracy – Calibration error
- Nonlinearity – Saturation – Repeatability – Reliability – Uncertainty. Physical principles of sensing: electric charges - fields - potentials – capacitance – magnetism – resistance – piezoelectric effect — sound waves – Temperature and thermal properties of materials - heat transfer – light – dynamic models of sensor elements.

UNIT 2 OPTICAL COMPONENTS AND INTERFACE ELECTRONICS

9 Hrs.

Optical Components of sensors: Radiometry – Photometry – Windows - mirrors – lenses – Fresnel Lenses - fiber optics – concentrators. Interface electronic circuits: Input characteristics – amplifiers – light-to-voltage converters – Excitation circuits – Analog-to-Digital converters – Direct digitization – Capacitance-to-voltage converters – Bridge circuits – data transmission – noise in sensors and circuits – calibration – Batteries for low power sensors.

UNIT 3 MOTION RELATED SENSORS

9 Hrs.

Occupancy and motion detectors: Ultrasonic – microwave motion – capacitive occupancy – triboelectric – optoelectronic motion – optical presence sensors – Pressure-gradient sensors. Velocity and acceleration: Accelerometer characteristics – capacitive accelerometers – piezo resistive accelerometers – piezoelectric accelerometers – thermal accelerometers – Gyroscopes – piezoelectric cables –gravitational sensors.

UNIT 4 FLOW SENSORS AND LIGHT DETECTORS

9 Hrs.

Flow sensors: Basics of flow dynamics - Pressure gradient technique - Ultrasonic - Electromagnetic - Breeze - Drag Force sensors - Dust and smoke detectors. Light Detectors: Photodiodes – phototransistor – photo resistors – Cooled detectors – Image sensors – Thermal detectors: Bolometers
- Active far-infrared sensors – optical design – gas flame detectors.

UNIT 5 TEMPERATURE AND CHEMICAL SENSORS

9 Hrs.

Temperature Sensors: coupling with objects – temperature reference points – thermo resistive sensors – thermoelectric contact sensors – acoustic temperature sensors – piezoelectric temperature sensors. Chemical sensors: characteristics – classes of chemical sensors – biochemical sensors – multi sensor arrays – electronic noses and tongues. Humidity and moisture sensors.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to **CO1** - Comprehend the characteristics of sensors. **CO2** – identify the optical components of sensors. **CO3** - Recognize appropriate motion-related sensors. **CO4** - Use the flow sensors for an application.

CO5 - Learn the thermoelectric sensor and piezoelectric sensor.

CO6 - Realize appropriate temperature and chemical sensors.

TEXT / REFERENCE BOOKS

1. Jacob Fraden, "Handbook of Modern Sensors: Physics - Designs - and Applications", 4th Edition, Springer, 2010.
2. Ian Sinclair, "Sensors and Transducers", 3rd Edition, Elsevier, 2011.
3. John Vetelino and Aravind Reghu, "Introduction to sensors", CRC Press, 2011.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100
Hrs.

Exam Duration: 3

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	