KRISHNA UNIVERSITY

B.Sc., Honours in Computer Science MAJOR

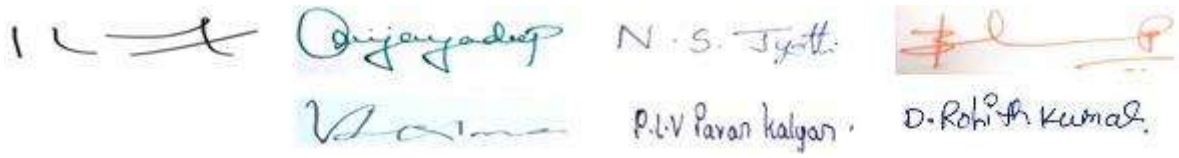
w.e.f AY 2023-24 onwards

COURSE STRUCTURE

Year	Semester	Course	Title	Hrs./ Week	Credits
I	I	1	Essentials and applications of Mathematical, Physical and Chemical Sciences	5	4
		2	Advances in Mathematical, Physical and Chemical Sciences	5	4
	II	3	Problem Solving using C - (T)	3	3
			Problem Solving using C- (P)	2	1
		4	Digital Logic Design- (T)	3	3
			Digital Logic Design- (P)	2	1
II	III	5	Object Oriented Programming using Java- (T)	3	3
			Object Oriented Programming using Java - (P)	2	1
		6	Data Structures using C - (T)	3	3
			Data Structures using C - (P)	2	1
		7	Computer Organization - (T)	3	3
			Computer Organization- (P)	2	1
		8	Operating Systems - (T)	3	3
			Operating Systems - (P)	2	1
	IV	9	Database Management System - (T)	3	3
			Database Management System - (P)	2	1
		10	Object Oriented Software Engineering - (T)	3	3
			Object Oriented Software Engineering - (P)	2	1
		11	Data Communications and Computer Networks - (T)	3	3
			Data Communications and Computer Networks - (P)	2	1
III	V	12	Web Interface Designing Technologies - (T)	3	3
			Web Interface Designing Technologies - (P)	2	1
		13	Web Applications Development using PHP & MYSQL - (T)	3	3
			Web Applications Development using PHP & MYSQL - (P)	2	1
		14 A	Internet of Things (T)	3	3
			Internet of Things (P)	2	1
			OR		
		14 B	Foundations of Data Science - (T)	3	3
			Foundations of Data Science - (P)	2	1

		15 A	IoT Applications Development and Programming - (T)	3	3
			IoT Applications Development and Programming - (P)	2	1
			OR		
		15 B	Application development using Python - (T)	3	3
			Application development using Python - (P)	2	1
	VI		Internship/ Apprenticeship		
IV	VII	16 A	Advanced Data Structures - (T)	3	3
			Advanced Data Structures - (P)	2	1
			OR		
		16 B	Artificial Intelligence - (T)	3	3
			Artificial Intelligence - (P)	2	1
		17 A	Computer Graphics - (T)	3	3
			Computer Graphics - (P)	2	1
			OR		
		17 B	Design and Analysis of Algorithms - (T)	3	3
			Design and Analysis of Algorithms - (P)	2	1
		18 A	Principles of Machine Learning - (T)	3	3
			Principles of Machine Learning - (P)	2	1
			OR		
		18 B	Software Testing- (T)	3	3
			Software Testing- (P)	2	1
	SEC	19 A	Advanced Java Programming - (T)	3	3
			Advanced Java Programming - (P)	2	1
			OR		
		19 B	Mobile Application Development - (T)	3	3
			Mobile Application Development - (P)	2	1
		20 A	MEAN Stack Development - (T)	3	3
			MEAN Stack Development - (P)	2	1
			OR		
		20 B	R Programming - (T)	3	3
			R Programming - (P)	2	1
	VIII	21 A	Big Data Technologies - (T)	3	3
			Big Data Technologies - (P)	2	1
			OR		
		21 B	Compiler Design - (T)	3	3
			Compiler Design - (P)	2	1
		22 A	Data Mining Concepts & Techniques - (T)	3	3
			Data Mining Concepts & Techniques - (P)	2	1
			OR		
		22 B	Digital Image Processing - (T)	3	3

			Digital Image Processing - (P)	2	1
		23A	Information Security and Cryptography - (T)	3	3
			Information Security and Cryptography - (P)	2	1
			OR		
		23 B	Mobile ADHOC and Sensor Networks - (T)	3	3
			Mobile ADHOC and Sensor Networks - (P)	2	1
	SEC	24 A	Advanced DBMS - (T)	3	3
			Advanced DBMS - (P)	2	1
			OR		
		24 B	Cloud Computing - (T)	3	3
			Cloud Computing - (P)	2	1
		25 A	Computer Vision - (T)	3	3
			Computer Vision - (P)	2	1
			OR		
		25 B	Digital Forensics - (T)	3	3
			Digital Forensics - (P)	2	1



V Semester

Course 12: Web Interface Designing Technologies

Credits -3

Learning Objectives:

To enable students to understand web architecture, develop aesthetic websites, create static and dynamic web pages, implement user interactivity, and gain proficiency in installing and utilizing WordPress and plugins

Learning Outcomes: On successful completion of the course, students will be able to

1. Understand and appreciate the web architecture and services along with its basic building blocks
2. Gain knowledge about various components of a website related to aesthetics
3. Demonstrate skills regarding creation of a static website and addition of dynamic behavior to a website
4. Get experience on making user-interactive web pages.
5. Learn how to install word press and gain the knowledge of installing various plugins to usein their websites.

UNIT - I

HTML: Introduction to web designing, difference between web applications and desktop applications, introduction to HTML, HTML structure, elements, attributes, headings, paragraphs, images, tables, lists, blocks, symbols, embedding multi-media components in HTML, HTML forms

UNIT – II

CSS: CSS home, introduction, syntax, CSS combinators, colors, background, borders, margins, padding, height/width, text, fonts, tables, lists, position, overflow, float, pseudo class, pseudo elements, opacity, tool tips, image gallery, CSS forms, CSS counters.

UNIT – III

Java Script: What is DHTML, JavaScript, basics, variables, operators, statements, string manipulations, mathematical functions, arrays, functions. objects, regular expressions, exception handling.

UNIT-IV

Client-Side Scripting: Accessing HTML form elements using Java Script object model, basic data validations, data format validations, generating responsive messages, opening windows using java script, different kinds of dialog boxes, accessing status bar using java script, embedding basic animative features using different keyboard and mouse events.

UNIT – V

Word press: Introduction to word press, features, and advantages, installing and configuring word press and understanding its admin panel (demonstration only), working with posts, managing pages, working with media - Adding, editing, deleting media elements, working with widgets, using menus, working with themes, defining users, roles and profiles, adding external links, extending word press with plug-ins.

Text Book(s)

1. Chris Bates, Web Programming Building Internet Applications, Second Edition, Wiley (2007)
2. Paul S.WangSanda S. Katila, an Introduction to Web Design plus Programming, Thomson (2007).

Reference Books

1. Head First HTML and CSS, Elisabeth Robson, Eric Freeman, O'Reilly Media Inc.
2. An Introduction to HTML and JavaScript: for Scientists and Engineers, David R. Brooks. Springer, 2007
3. Schaum's Easy Outline HTML, David Mercer, Mcgraw Hill Professional.
4. Word press for Beginners, Dr.Andy Williams.
5. Professional word press, Brad Williams, David damstra, Hanstern.

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

Unit 1: Activity: Infographic explaining the necessity to have a web site for each of the agenciessuch as hotels, hospitals, supermarkets, and educational institutions.

Evaluation Method: Assess the accuracy, visual design, clarity, creativity, use of visual elements, presentation of the infographic explaining the necessity of a website for different agencies.

Unit 2: Activity: Seminar though PPT on various Look and Feel components that websites relatedto different agencies

Evaluation Method: Content knowledge, organization, clarity, presentation skills, visualaids, audience engagement

Unit 3: Activity: Code snippets Challenge.

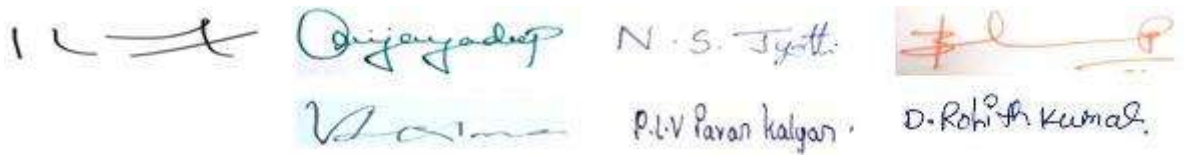
Evaluation Method: Accuracy, functionality, efficiency, code readability, and problem- solving approach of the JavaScript code snippets

Unit 4: Activity: Group discussion on different kinds of web forms that take and validate userinput using java script validations

Evaluation Method: Active participation, knowledge sharing, critical thinking, and demonstration of different web forms and JavaScript validations

Unit 5: Activity: Creation of Personal website using wordpress

Evaluation Method: Design aesthetics, functionality, user interactivity, contentorganization, and utilization of plugins.



V Semester

Course 12: Web Interface Designing Technologies

Credits -1

List of Experiments:

1. Create an HTML document with the following formatting options:
   (a) Bold, (b) Italics, (c) Underline, (d) Headings (Using H1 to H6 heading styles), (e) Font (Type, Size and Color), (f) Background (Colored background/Image in background), (g) Paragraph, (h) Line Break, (i) Horizontal Rule, (j) Pre tag
2. Create an HTML document which consists of:
   (a) Ordered List (b) Unordered List (c) Nested List (d) Image
3. Create a Table with four rows and five columns. Place an image in one column.
4. Using "table" tag, align the images as follows:

5. Create a menu form using html.
6. Style the menu buttons using CSS.
7. Create a form using HTML which has the following types of controls:
   (a) Text Box (b) Option/radio buttons (c) Check boxes (d) Reset and Submit buttons
8. Embed a calendar object in your web page.
9. Create a form that accepts the information from the subscriber of a mailing system.

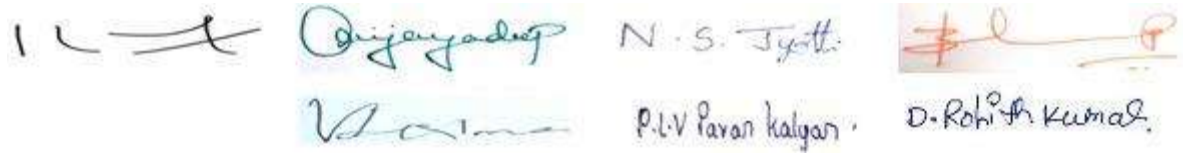
Word press:

10. Installation and configuration of word press
11. Access admin panel and manage posts
12. Access admin panel and manage pages
13. Add widgets and menus

N. S. Jyothi P.L.V Pavan kalyan D. Rohith Kumar

14. Create users and assign roles

15. Create a site and add a theme to it



V Semester

Course 13: Web Applications Development using PHP & MYSQL

Credits -3

Learning Objectives:

To enable students to understand open-source tools to create dynamic web pages, implement user interactivity, and gain proficiency in developing web sites

Learning Outcomes: On successful completion of the course, students will be able to

1. Write simple programs in PHP.
2. Understand how to use regular expressions, handle exceptions, and validate data using PHP.
3. Apply In-Built functions and Create User defined functions in PHP programming.
4. Write PHP scripts to handle HTML forms.
5. Know how to use PHP with a MySQL database and can write database driven web pages.

UNIT-I

The building blocks of PHP: Variables, Data Types, Operators and Expressions, Constants. **Flow Control Functions in PHP**: Switching Flow, Loops, Code Blocks and Browser Output.**Working with Functions:** Creating functions, Calling functions, Returning the values from User- Defined Functions, Variable Scope, Saving state between Function calls with the static statement,arguments of functions

UNIT-II

Working with Arrays: Creating Arrays, Some Array-Related Functions.

Working with Objects: Creating Objects, Accessing Object Instances, **Working with Strings**, **Dates and Time:** Formatting strings with PHP, Manipulating Strings with PHP, Using Date and Time Functions in PHP.

UNIT-III

Working with Forms: Creating Forms, Accessing Form Input with User defined Arrays, Combining HTML and PHP code on a single Page, Using Hidden Fields to save state, Redirectingthe user, Sending Mail on Form Submission, and **Working with File Uploads**, Managing files onserver, **Exception handling.**

UNIT-IV

Working with Cookies and User Sessions: Introducing Cookies, setting a Cookie with PHP, Session Function Overview, starting a Session, working with session variables, passing session IDs in the Query String, Destroying Sessions and Unsetting Variables, Using Sessions in an Environment with Registered Users.

UNIT-V

Interacting with MySQL using PHP: MySQL Versus MySQLi Functions, connecting to MySQL with PHP, Working with MySQL Data. Planning and Creating Database Tables,

Creating Menu, Creating Record Addition Mechanism, Viewing Records, Creating the Record Deletion Mechanism.

Text Book(s)

1. Julie C. Meloni, SAMS Teach yourself PHP MySQL and Apache, Pearson Education (2007).
2. Steven Holzner , PHP: The Complete Reference, McGraw-Hill

Reference Books

1. Robin Nixon, Learning PHP, MySQL, JavaScript, CSS & HTML5, Third Edition O'reilly, 2014
2. Xue Bai Michael Ekedahl, The web warrior guide to Web Programming, Thomson (2006).

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

Unit 1: Activity: Infographic explanation of client-server architecture and different server-side scripting languages.

Evaluation Method: Assess the accuracy, visual design, clarity, creativity, use of visual elements, presentation of the infographic explaining the benefits of server-side scripting languages.

Unit 2: Activity: Presentation on various open-source frameworks available in LAMP model

Evaluation Method: Content knowledge, organization, clarity, presentation skills, visual aids, audience engagement

Unit 3: Activity: Code snippets Challenge.

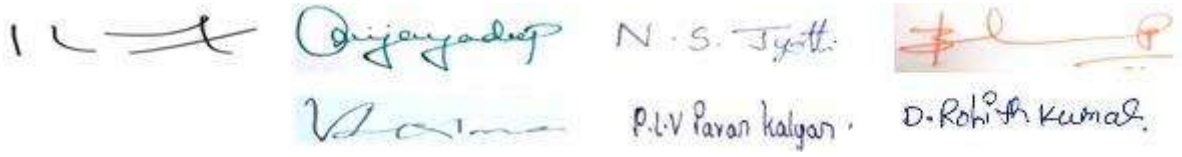
Evaluation Method: Accuracy, functionality, efficiency, code readability, and problem- solving approach of the PHP code snippets

Unit 4: Activity: Group discussion on Session Management in PHP

Evaluation Method: Active participation, knowledge sharing, critical thinking, and demonstration of Session Management

Unit 5: Activity: Hands-on Lab Session on MYSQL Queries

Evaluation Method: Lab Performance and Correctness of solution Implementation



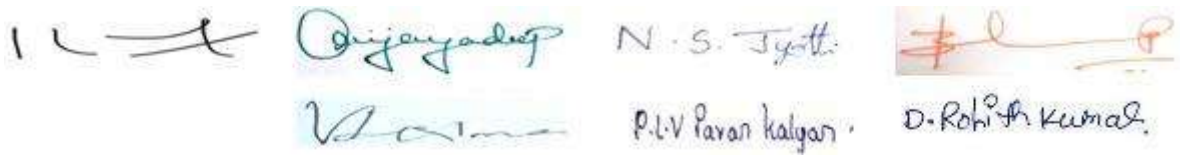
V Semester

Course 13: Web Applications Development using PHP & MYSQL

Credits -1

List of Experiments:

1. Write a PHP program to Display "Hello"
2. Write a PHP Program to display the today's date.
3. Write a PHP program to display Fibonacci series.
4. Write a PHP Program to read the employee details.
5. Write a PHP program to prepare the student marks list.
6. Create student registration form using text box, check box, radio button, select, submit button.And display user inserted value in new PHP page.
7. Create Website Registration Form using text box, check box, radio button, select, submitbutton. And display user inserted value in new PHP page.
8. Write PHP script to demonstrate passing variables with cookies.
9. Write a PHP script to connect MySQL server from your website.
10. Write a program to keep track of how many times a visitor has loaded the page.
11. Write a PHP application to perform CRUD (Create, Read, Update and Delete) operations on a database table.
12. Create a web site using any open-source framework built on PHP and MySQL – It is a team activity wherein students are divided into multiple groups and each group comes up with their own website with basic features.



V Semester

Course 14 A: Internet of Things

Credits -3

Learning Objectives:

To enable students to understand basic IoT constructs, create IoT solutions to real world problems using IoT

Learning Outcomes: On successful completion of the course, students will be able to

1. Understand various concepts, terminologies and applications of IoT
2. Learn how to build IoT devices with development boards
3. Understand various Wireless protocols for IoT
4. Learn how to use various sensors and actuators & develop IoT solutions using Arduino
5. Develop and Connect IoT with Cloud Platforms.

UNIT - I

Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M.

Applications of IoT: Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.

UNIT - II

Sensors Networks : Definition, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, RaspberriPi Development Kit, RFID Principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT.

Unit - III

Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet and Modbus.

IP Based Protocols for IoT: IPv6, 6LowPAN, LoRA, RPL, REST, AMPQ, CoAP, MQTT. Edge connectivity and protocols.

Unit - IV

Arduino Simulation Environment: Arduino Uno Architecture, Setting up the IDE, Writing Arduino Software, Arduino Libraries, Basics of Embedded C programming for Arduino, Interfacing LED, push button and buzzer with Arduino, Interfacing Arduino with LCD.

Sensor & Actuators with Arduino: Overview of Sensors working, Analog and Digital Sensors, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensors with Arduino, Interfacing of Actuators with Arduino, Interfacing of Relay Switch and Servo Motor with Arduino.

Unit - V

Developing IOT's: Implementation of IoT with Arduino, Connecting and using various IoT Cloud Based Platforms such as Blynk, Thingspeak, AWS IoT, Google Cloud IoT Core etc. Cloud Computing, Fog Computing, Privacy and Security Issues in IoT.

Text Book(s)

1. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Sudip Mishra, Anandarup Mukherjee, Arijit Roy: Introduction to IOT, Cambridge University Press.
3. Internet of Things- Dr Surya Durbha & Dr Jyoti Joglekar, Oxford University Press

Reference Books

1. Daniel Minoli, — "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications
2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

Unit 1: Activity: Seminar on various applications of IoT through PPT

Evaluation Method: Content knowledge, organization, clarity, presentation skills, visualaids, audience engagement

Unit 2: Activity: Hands-on Lab activity on Arduino Development

Evaluation Method: Lab Performance and Correctness of Circuit Implementation

Unit 3: Activity: Group discussion on Future Wireless Technologies.

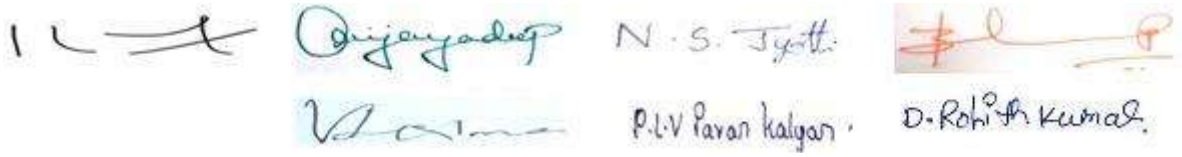
Evaluation Method: Active participation, knowledge sharing, critical thinking, and demonstration of different wireless technologies for IoT

Unit 4: Activity: Peer activity on different types of Sensors

Evaluation Method: Peer evaluation of working principle of Sensor, use-cases of sensors.

Unit 5: Activity: Guest Lecture or Expert talk on Cloud based IoT platforms

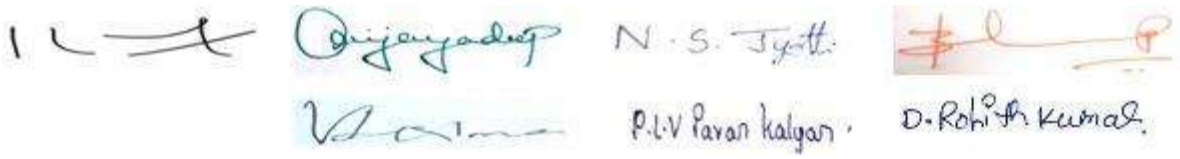
Evaluation Method: Active Participation, Post Talk report presentation



V Semester
Course 14 A: Internet of Things
Credits -1

List of Experiments

1. Understanding Arduino UNO Board and Components
2. Installing and work with Arduino IDE
3. Blinking LED sketch with Arduino
4. Simulation of 4-Way Traffic Light with Arduino
5. Using Pulse Width Modulation
6. LED Fade Sketch and Button Sketch
7. Analog Input Sketch (Bar Graph with LEDs and Potentiometre)
8. Digital Read Serial Sketch (Working with DHT/IR/Gas or Any other Sensor)
9. Working with Adafruit Libraries in Arduino
10. Spinning a DC Motor and Motor Speed Control Sketch
11. Working with Shields
12. Design APP using Blink App or Things peak API and connect it LED bulb.
13. Design APP Using Blynk App and Connect to Temperature, magnetic Sensors.



V Semester

Course 14 B: Foundations of Data Science

Credits -3

Learning Objectives:

To enable students to develop IoT solutions for real-world problems

Learning Outcomes: On successful completion of the course, students will be able to

1. Identify the need for data science and understand various data collection strategies
2. Understand about NoSQL and Descriptive Statistics
3. Apply Numpy methods to process the data in an array.
4. Summarize and Compute Descriptive Statistics using Pandas.
5. Apply powerful data manipulations visualization using Pandas

UNIT-I

Introduction to Data Science: Need for Data Science – What is Data Science - Evolution of Data Science, Data Science Process – Business Intelligence and Data Science – Prerequisites for a Data Scientist – Tools and Skills required. Applications of Data Science in various fields – Data Security Issues.

Data Collection Strategies, Data Pre-Processing Overview, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization, Data Munging, Filtering

UNIT-II

Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis; Box Plots – Pivot Table – Heat Map – Correlation Statistics –ANOVA.

No-SQL: Document Databases, Wide-column Databases and Graphical Databases.

UNIT-III

Python for Data Science –Python Libraries, Python integrated Development Environments (IDE)for Data Science, **NumPy Basics:** Arrays and Vectorized Computation- The NumPy ndarray-

Creating ndarrays- Data Types for ndarrays- Arithmetic with NumPy Arrays- Basic Indexing and Slicing - Boolean Indexing-Transposing Arrays and Swapping Axes.

Universal Functions: Fast Element-Wise Array Functions- Mathematical and Statistical Methods- Sorting- Unique and Other Set Logic.

UNIT-IV

Introduction to pandas Data Structures: Series, Data Frame and Essential Functionality: Dropping Entries- Indexing, Selection, and Filtering- Function Application and Mapping- Sortingand Ranking.

Summarizing and Computing Descriptive Statistics- Unique Values, Value Counts, and Membership. Reading and Writing Data in Text Format.

UNIT-V

Data Cleaning and Preparation: Handling Missing Data - Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Detecting and Filtering Outliers-

Plotting with pandas: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots.

Text Book(s)

1. Y. Daniel Liang, "Introduction to Programming using Python", Pearson, 2012.
2. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy,and IPython", O'Reilly, 2nd Edition, 2018.

Reference Books

1. Sanjeev Wagh, Manisha Bhende, Anuradha Thakare, 'Fundamentals of Data Science, CRC Press, 1st Edition, 2022
2. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly, 2017.

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

Unit 1: Activity: Seminar on Role of Data Science in Politics

Evaluation Method: Content knowledge, organization, clarity, presentation skills, visualaids, audience engagement

Unit 2: Activity: Exercises on Descriptive Statistics

Evaluation Method: Problem Solving, Accuracy

Unit 3: Activity: Hands-on Lab using Numpy

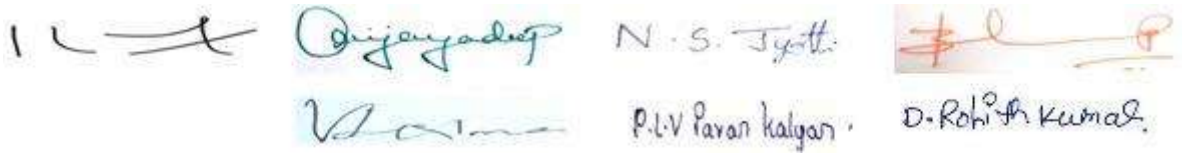
Evaluation Method: Lab Performance and Correctness of solution Implementation

Unit 4: Activity: Hands-on Lab Activity on Pandas

Evaluation Method: Lab Performance and Correctness of solution Implementation.

Unit 5: Activity: Group Activity to visualize college performance records using various plots

Evaluation Method: Active Participation, Post Talk report presentation



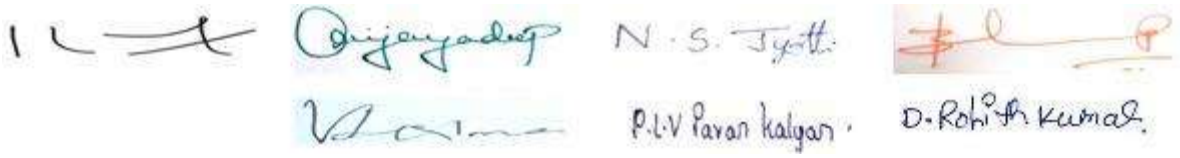
V Semester

Course 14 B : Foundations of Data Science

Credits -1

List of Experiments:

1. Study on various python IDEs for Data Science
2. Create NumPy arrays from Python Data Structures, Intrinsic NumPy objects and Random Functions.
3. Manipulation of NumPy arrays- Indexing, Slicing, Reshaping, Joining and Splitting.
4. Computation on NumPy arrays using Universal Functions and Mathematical methods.
5. Create Pandas Series and Data Frame from various inputs.
6. Import any CSV file to Pandas Data Frame and perform the following:
    a. Visualize the first and last 10 records
    b. Get the shape, index and column details
    c. Select/Delete the records (rows)/columns based on conditions.
    d. Perform ranking and sorting operations.
    e. Do required statistical operations on the given column
7. Import any CSV file to Pandas Data Frame and perform the following:
    a. Handle missing data by detecting and dropping/ filling missing values.
    b. Transform data using apply () and map() method.
    c. Detect and filter outliers.
    d. Perform Vectorized String operations on Pandas Series.
    e. Visualize data using Line Plots, Bar Plots, Histograms, Density Plots and Scatter Plots.



V Semester

Course 15 A: IoT Applications Development and Programming

Theory 03 hours /Week Credits -3

Learning Objectives:

To enable students to develop IoT solutions for real-world problems

Learning Outcomes: On successful completion of the course, students will be able to

1. Understand the Basic Concepts of Internet of Things
2. Learn various Sensors and their associative protocols
3. Learn the Single Board Computers for development of IoT
4. Build the IoT devices with the Node-RED without Complex coding
5. Develop various IoT real-time applications

UNIT-I

Overview of the Internet of Things (IoT) and Sensors: Sensors - Energy-based, Signal Output, Mode of Operation, Electronic Sensors. Connectivity - Bluetooth, Zigbee, Wi-Fi, LoRa, Wired Communication. Machine Intelligence, Active Management, Sensor Fusion, Smart Devices- Human- Computer Interaction, Context Awareness, Actuators, IoT and Smart City Applications- Automobile Sensors, Smart Home Sensors, Smart Transportation Sensors.

UNIT-II

IoT Sensors and Their Interfacing Protocols: Vision and Imaging Sensors- Line Scan Cameras, 3D Depth Cameras, **Sensors That Measure Temperature**-Thermocouples, Resistance Temperature Detector (RTD), Temperature Thermistor Sensors, Semiconductor Temperature Sensors, Radiation Sensors; Proximity Sensors, Pressure Sensors, Position Sensors, Photoelectric Sensors, Particle Sensors, Types of Particle Sensors-Metal Detectors, Level Sensors, Leak Detectors, Humidity Sensors, Gas and Chemical Sensors, Gas Detectors,Carbon Monoxide (MQ7) Detectors, Flame Detectors, **Sensor Communication Protocols**

UNIT-III

Programming Single Board Computers: Arduino Programming, Raspberry Pi- Basic functionality of Raspberry Pi B+ board, setting up the board, configuration and use, Basics of Linux and its use, Introduction to Raspberry Pi GPIO Access, Interfacing DHT,

Interfacing Picamto Raspberry Pi zero w, Pi Camera Specifications, Pi Camera Access, Interfacing PIR Sensor

Python: File Concepts, Spreadsheet Concepts, Communication Concepts, Wired and Wireless Programming Concepts

UNIT-IV

Node-RED: Node-RED Features, Installation of Node-RED, Node-RED Architecture, Node-RED Flow Editor, Basic Function Nodes, Node-RED Library, Node-RED Applications; MQTT Protocols, Google Sheets Programming (gspread), Firebase Programming, Matplotlib- Getting Started, Bar Graphs, Scatter Plot, Spectrum Representation, Coherence of Two Signals, Cross-Correlation Graph, Autocorreleation Graph, Changing Figure Size in Different Units, Scale Pie Charts, Style Sheets- FiveThirtyEight Style Sheet, Solarized Light Style Sheet.

UNIT-V

Wireless Connectivity in IoT: Introduction, Low-Power Wide-Area Networks (LPWANs),RFID Protocol, XBEE Radios with Arduino, Bluetooth with Arduino, Arduino with a GSMModem, Arduino with Firebase Cloud Connectivity

The Internet of Things through the Raspberry Pi: Introduction, Cluster Computing with Raspberry Pi Zero W-Message Passing Interface (MPI), Networking with RP is for Simple MPI Scripts, Simple MPI Programming

Text Book(s)

1. **Internet of Things Using Single Board Computers**, *G. R. Kanagachidambaresan*, Apress, 2022.
2. **Practical Node-RED Programming**, *Taiji Hagino*, Packt Publishing, 2021

Reference Books

1. **Internet of Things Programming Projects: Build modern IoT solutions with the Raspberry Pi 3 and Python,** *Colin Dow***,** Packt Publishing, 2021
2. **Programming the Internet of Things: An Introduction to Building Integrated, Device- to-Cloud IoT Solutions,** *Andy King***,** O'Reilly Media, 2021

N. S. Jyothi P.L.V Pavan kalyan D. Rohith Kumar

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

Unit 1: Activity: Case Study Presentation on Smart City IoT realization

Evaluation Method: Content knowledge, organization, clarity, presentation skills, visual aids, audience engagement

Unit 2: Activity: Poster Presentation for various kinds of Sensors

Evaluation Method: Creative & informative posters or infographics on Sensors

Unit 3: Activity: Hands-on Lab using RPi.

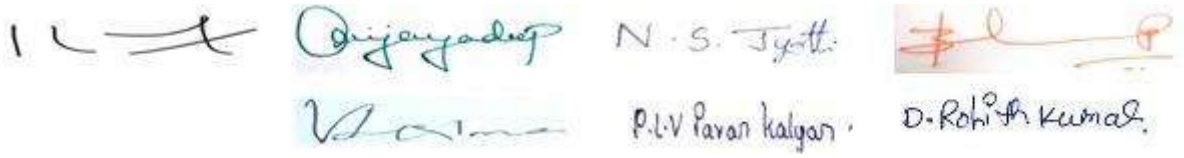
Evaluation Method: Lab Performance and Correctness of solution Implementation

Unit 4: Activity: Hands-on Lab Activity on Node-RED

Evaluation Method: Lab Performance and Correctness of solution Implementation.

Unit 5: Activity: Guest Lecture or Expert talk on Cloud based IoT platforms

Evaluation Method: Active Participation, Post Talk report presentation



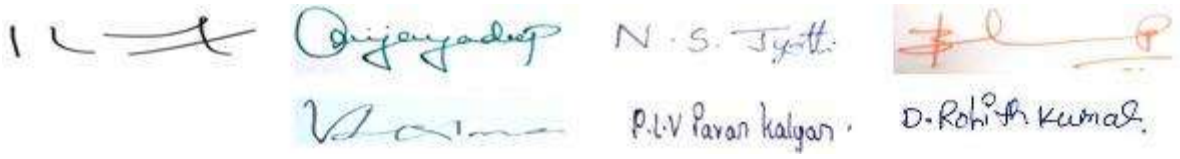
V Semester

Course 15 A: IoT Applications Development and Programming

Credits -1

List of Experiments:

1. Write a program to switch light on when the input is 1 and switch the light off when the input is 0 using Raspberry pi
2. Install Node-RED and Flow-based Programming Development Environment
3. Create Basic Flows with Major Nodes
4. Develop a Node-Red Flow for various Case Studies
5. Implement Node-RED in the Cloud Calling a Web API from Node-RED
6. Create a To Do Application with Node-RED Handling Sensor Data on the Raspberry Pi
7. Develop a Dashboard with various 2D Graphs with Matplotlib
8. Install MySQL database in Raspberry pi.
9. Write a program to work with basic MySQL queries by fetching data from database in Raspberry pi.
10. Arduino with Firebase Cloud Connectivity
11. Visualize Data by Creating a Server-side Application in the Firebase



V Semester

Course 15 B : Application Development using Python

Credits -3

Learning Objectives:

To enable students to develop IoT solutions for real-world problems

Learning Outcomes: On successful completion of the course, students will be able to

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Demonstrate proficiency in handling Strings and File Systems.
3. Create, run and manipulate Python Programs using core data structures like Lists,Dictionaries and use Regular Expressions.
4. Interpret the concepts of Web Programming and GUI in Python
5. Apply concepts of Python programming in various fields related to IOT, Web Services and Databases in Python.

UNIT-I

Python basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types

Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules

Sequences - Strings, Lists, and Tuples, Dictionaries and Set Types

Control Flow, Truthiness, Sorting, List Comprehensions, Generators and Iterators

UNIT-II

Files: File Objects, File Built-in Function [open()], File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions, Why Exceptions (Now)?, Why Exceptions at All?, Exceptions and the sys Module, Related Modules **Modules:** Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules

UNIT-III

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python**Multithreaded Programming**: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules

UNIT-IV

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs

Web Programming: Introduction, Wed Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application, Advanced CGI, Web (HTTP) Servers

UNIT-V

Database Programming: Introduction, Python Database Application Programmer's Interface (DBAPI), Object Relational Managers (ORMs), Related Modules

Text Book(s)

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.
2. Think Python, Allen Downey, Green Tea Press.

Reference Books

1. Introduction to Python, Kenneth A. Lambert, Cengage.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
3. Learning Python, Mark Lutz, O' Really.

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

Unit 1: Activity: Hands-on Lab exercise on Python Control Statements

Evaluation Method: Lab Performance and Correctness of solution Implementation

Unit 2: Activity: Assignment of Files in Python

Evaluation Method: Problem Solving, Accuracy

Unit 3: Activity: Exercises on Regular expressions

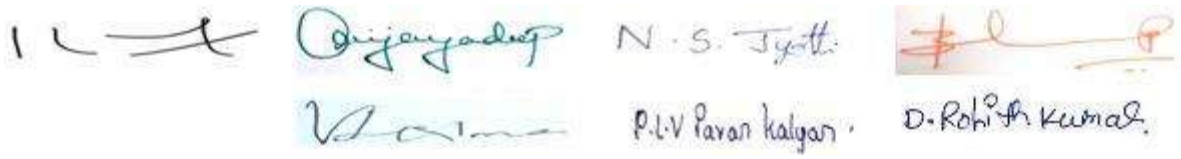
Evaluation Method: Solutions, Accuracy of Validation

Unit 4: Activity: Poster Presentation on various GUI components in Python

Evaluation Method: Content knowledge, organization, clarity, presentation skills, visualaids.

Unit 5: Activity: Group Project

Evaluation Method: Project effectiveness, User interface, Solution to the Problem



V Semester

Course 15 B: Application Development using Python

Credits -1

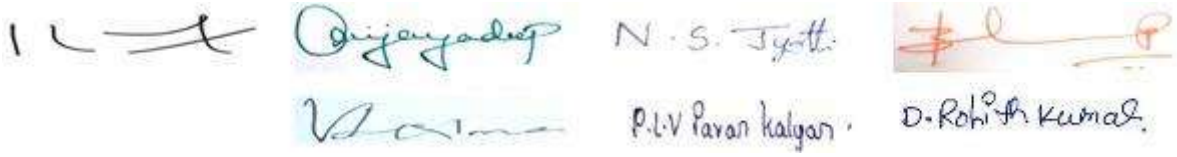
List of Experiments:

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsiusand vice versa depending upon user's choice.
2. Write a python program to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades accordingto the following criteria :

   Grade A: Percentage >=80 Grade B: Percentage>=70 and 80

   Grade C: Percentage>=60 and <70 Grade D: Percentage>=40 and <60 Grade E: Percentage<40

3. Demonstrate various methods of Sequence Data Types
4. Write a python program to display the first n terms of Fibonacci series.
5. Write a python program to calculate the sum and product of two compatible matrices.
6. Write a function that takes a character and returns True if it is a vowel and False otherwise.
7. Write a program to implement exception handling.
8. Write a program to implement Multithreading
9. Develop a Python GUI calculator using Tkinter
10. Write a Python program to read last 5 lines of a file.
11. Design a simple database application that stores the records and retrieve the same
12. Design a database application to search the specified record from the database.
13. Design a database application to that allows the user to add, delete and modify the records.



VII Semester

Course 16 A: Advanced Data Structures

Credits -3

Learning Objective:

To familiarize with the organization of data so as to optimize the searching time

Learning Outcomes: Upon completion of the course, students will be able to:

1. Apply appropriate hashing techniques for a given problem.
2. Simulate the operations of Heap trees.
3. Provide solutions using multi-way search trees.
4. Choose appropriate algorithm while establishing a network.
5. Apply the knowledge of disjoint sets for solving a given problem.

UNIT-I

Hashing – General Idea, Hash Function, Separate Chaining, Hash Tables without linked lists: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Hash Tables in the Standard Library, Universal Hashing, Extendible Hashing.

UNIT-II

Priority Queues (Heaps) – Model, Simple implementations, Binary Heap: Structure Property, Heap Order Property, Basic Heap Operations: insert, delete, Percolate down, other Heap Operations.

Binomial Queues: Binomial Queue Structure, Binomial Queue Operations, Implementation of Binomial Queue, Priority Queues in the Standard Library.

UNIT-III

Trees – **AVL**: Single Rotation, Double Rotation, B-Trees, B^+ Trees

Multi-way Search Trees – 2-3 Trees: Searching for an element in a 2-3 Tree, inserting a new element in a 2-3 Tree, deleting an element from a 2-3 Tree.

Red-Black Trees – Properties of red-black trees, rotations, insertion, deletion.

UNIT-IV

Graph Algorithms – Elementary Graph Algorithms: Topological sort, Single Source ShortestPath Algorithms: Dijkstra's, Bellman-Ford, All-Pairs Shortest Paths: Floyd-Warshall's Algorithm.

UNIT-V

Disjoint Sets – Equivalence relation, Basic Data Structure, Simple Union and Find algorithms, Smart Union and Path compression algorithm.

Text Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahani and Rajasekharam, 2nd Edition, 2009, University Press Pvt. Ltd.
2. Advanced Data Structures, Reema Thareja, S. Rama Sree, Oxford University Press, 2018.

Reference Books:

1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 4 th Edition, 2014, Pearson.
2. Introduction to Algorithms, Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, 3 rd Edition, 2009, The MIT Press.

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

Unit 1: Activity: Quiz on hashing techniques, covering concepts, algorithms, and applications.

Evaluation Method: Assess students' understanding of hashing techniques through quiz scores and performance.

Unit 2: Activity: Seminar on Heap Trees

Evaluation Method: Evaluate the clarity, depth of understanding, and presentation skills demonstrated in the seminar.

Unit 3: Activity: Group Project to design and implement a multi-way search tree data structure,along with algorithms for insertion, deletion, and searching.

Evaluation Method: Functionality, correctness, and efficiency of the multi-way search tree implementation.

Unit 4: Activity: Role Play to simulate the process of establishing a network, making algorithmic decisions along the way.

Evaluation Method: Students' understanding and application of network establishment algorithms through their decision-making process during the role play.

Unit 5: Activity: Puzzle Challenge that can be solved using disjoint sets, and encourage them toapply their knowledge to find a solution.

Evaluation Method: Assess the correctness and efficiency of students' solutions to the puzzle or problem involving disjoint sets.

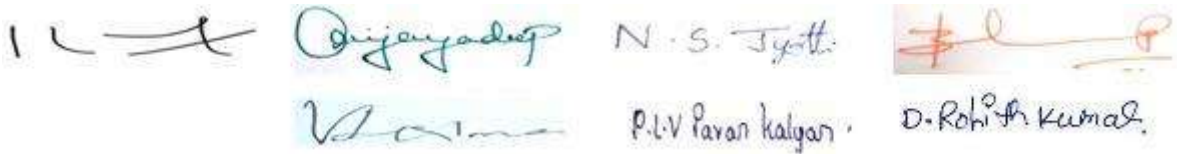
VII Semester

Course 16 A: Advanced Data Structures

Credits -1

List of Experiments:

1. Implement Linear probing Hashing Technique.
2. Implement Quadratic probing Hashing Technique.
3. Implement Binary Heap and its operations.
4. Implement AVL Trees and its operations.
5. Implement the operations on B Trees
6. Implement 2-3 Trees and its operations.
7. Implement the operations of Red-Black trees
8. Implement Dijkstra's shortest path algorithm.
9. Implement Bellman-Ford shortest path algorithm.
10. Implement Floyd-Warshall's Algorithm.
11. Implement disjoint sets and its operations.
12. Implement Union and Find algorithms



VII Semester

Course 16 B: Artificial Intelligence

Credits -3

Learning Objective:

To provide students with a comprehensive understanding of artificial intelligence (AI) principlesand techniques

Learning Outcomes: Students after successful completion of the course will be able to:

1. Analyze AI problems and search techniques using underlying assumptions and AI techniques.
2. Apply heuristic search techniques for problem-solving and optimization.
3. Understand knowledge representation approaches and apply predicate logic forrepresenting facts and relationships.
4. Utilize rule-based systems for representing knowledge and apply reasoning techniques for problem-solving.
5. Implement symbolic reasoning under uncertainty and augment problem-solving strategieswith non-monotonic reasoning.

UNIT- I

Problems and Search: What is Artificial Intelligence, The AI Problems, and Underlying Assumption, what is an AI Technique?

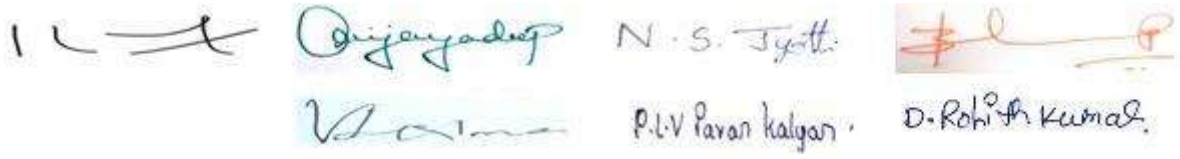
Problems, Problems Spaces, and Search: Defining the problem as a state space search,production systems, problems characteristics, issues in the design of search programs.

UNIT- II

Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis

UNIT- III

Knowedge Representation Issues: Representations and Mapping, Approaches to Knowledge Representation, The frame problem. Using Predicate Logic: Representing simple facts in logic, Representing Isa relationships, predicates, Resolution



UNIT- IV

Representing Knowledge using Rules: Procedural Vs Declarative knowledge, Logic Programming, Forward Vs Backward Reasoning, Matching, Control Knowledge

UNIT- V

Symbolic Reasoning under Uncertainty: Introduction to Non-monotonic Reasoning, Logicsfor Non-monotonic Reasoning, Implementation issues, Augmenting a Problem solver, implementation: DFS, BFS.

Statistical Reasoning: Probability and Bayes Theorem, Certainty Factors and Rule-Based Systems, Bayesian Networks, Dempster-**Shafer** Theory.

Text Books:

1. Russell, S., & Norvig, P. Artificial intelligence: a Modern approach. Third Edition. Pearson new international edition. 2014.

Reference Books:

2. Artificial Intelligence, Second Edition, Elaine Rich, Kevin Knight, Tata McGraw-Hill Edition.

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

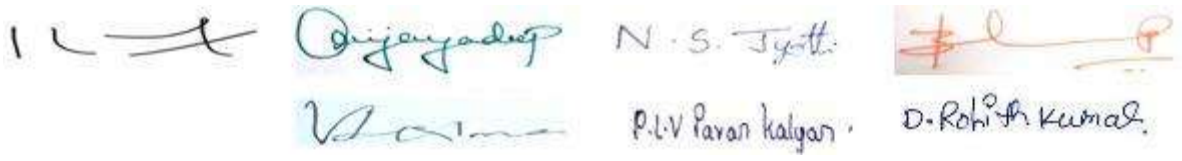
Unit 1: Activity: Group discussion on real-world AI problems and possible search techniques.
Evaluation Method: Active Participation, Presentation and analysis of group discussion outcomes.

Unit 2: Activity: Problem-solving tasks using heuristic search algorithms.
Evaluation Method: Assessment of problem-solving approach and solution quality.

Unit 3: Activity: Hands-on activity to create knowledge representations using predicate logic.
Evaluation Method: Evaluation of knowledge representation accuracy and logical reasoning.

Unit 4: Activity: Scenario-based problem-solving using rule-based systems.
Evaluation Method: Assessment of problem-solving approach and solutioneffectiveness.

Unit 5: Activity: Simulation activity to implement symbolic reasoning under uncertainty.
Evaluation Method: Evaluation of simulation results and reasoning accuracy.



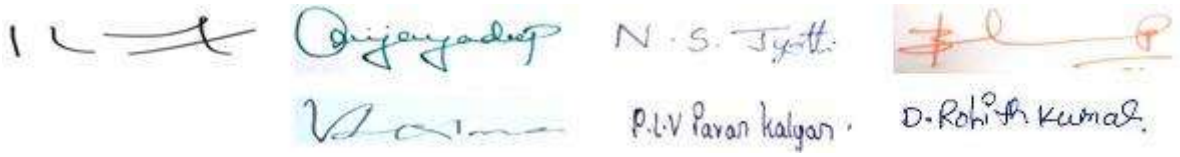
VII Semester

Course 16 B: Artificial Intelligence

Credits -1

List of Experiments:

1. Write a Program to Implement Breadth First Search
2. Write a Program to Implement Depth First Search
3. Write a Program to Implement Tic-Tac-Toe game.
4. Write a Program to implement 8-Puzzle problem
5. Write a Program to Implement Water-Jug problem
6. Write a Program to Implement Travelling Salesman problem
7. Write a Program to Implement Towers of Hanoi problem
8. Write a Program to implement 8-Queens problem



VII Semester

Course 17 A: Computer Graphics

Credits -3

Learning Objective:

To Develop a comprehensive understanding of computer graphics principles, techniques, and algorithms, and apply them to create visually appealing 2D and 3D graphics.

Learning Outcomes:

Students after successful completion of the course will be able to:

1. Understand computer graphics fundamentals
2. Perform 2D and 3D
3. Apply window-to-view port transformation and perform line and polygon clipping operations.
4. Determine visible surfaces and apply computer graphics algorithms for depth comparison, back-face removal, and rendering.
5. Apply animation principles, work with Flash interface, and gain an introduction to virtual reality.

UNIT-I

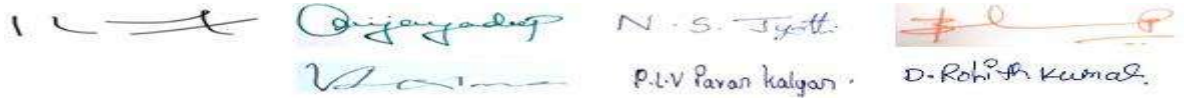
Introduction: Advantage of Computer Graphics and Areas of Applications, Hardware andSoftware for Computer Graphics- Hard Copy, Display Technologies, Random Scan Display System, Video Controller, Random Scan Display Processor, Raster Graphics, Scan Conversion Algorithms (Line, Circle, Ellipse), Area Filling (Rectangle, Ellipse), Clipping (Lines, Circle, Ellipse), Clipping Polygons

UNIT-II

Two dimensional and three-dimensional transformations: 2-Dimensional transformation, 2-D Translation, Rotation, Scaling, Homogeneous Coordinates, Reflection, Shear transform, 3-dimensional transformation, 3-D Translation, Rotation Scaling, Reflection, Shear.

UNIT-III

Clipping: Window to view port transformation, Clipping, line clipping, Cohen —Sutherland line clipping, Polygon clipping, Sutherland and Gary Hodgman polygon clipping algorithm



UNIT-IV

Visible Surface Determination and Computer Graphics algorithm: Image space and object space techniques, Hidden Surface removal—Depth comparison Z-Buffer Algorithm, Back-Face Removal, The Painter's Algorithm, Scan-Line Algorithm, Light and Color and different color models (RGB,CMY, YIQ)

UNIT-V

Animation and Virtual Reality: Basic Principles of Animation and Types of Animation, Introduction to the flash interface: Setting stage dimensions, working with panels, panel layouts, Layers & Views, Shaping Objects – Overview of shapes, Drawing & Modifying Shapes, Bitmap Images & Sounds

Animation -Principles, Frame by frame animation, tweening, masks, Introduction to virtual reality.

Text Books

1. Foley, J. D., A. V. Dam, S. K. Feiner, J. F. Hughes, Computer Graphics Principle and Practices, Addison Wesley Longman, Singapore Pvt. Ltd.,

Reference Books

1. Hearn Donald, M. P. Baker, Computer Graphics, 2E, Prentice Hall of India Private Limited, New Delhi
2. Robert R & Snow D Flash CS4 Professional Bible, Wiley Publishing

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

Unit 1: Activity: Quiz on computer graphics concepts and terminology.
Evaluation Method: Knowledge of computer graphics principles and concepts

Unit 2: Activity: Hands-on lab sessions on 2D and 3D graphics programming.
aluation Method: Practical assignments evaluating the implementation of 2D and 3Dgraphics operations

Unit 3: Activity: Group Project on window-to-view port transformation and clipping algorithms
Evaluation Method: Project effectiveness, Functionality, Solution to the Problem

Unit 4: Activity: Seminar on visible surface determination algorithms and rendering techniques
Evaluation Method: Presentation and demonstration of projects showcasing theapplication of rendering algorithms and surface removal

Unit 5: Activity: Workshop on animation principles and Flash interface usage, hands-onexperience with virtual reality technologies and tools
Evaluation Method: Individual projects demonstrating the application of animation principles, Flash interface usage, and virtual reality

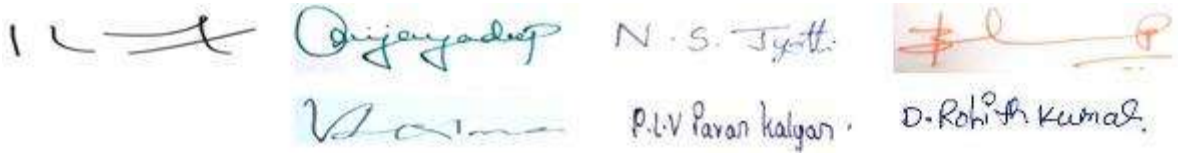
VII Semester

Course 17 A: Computer Graphics

Credits -1

List of Experiments:

1. Implement Brenham's line drawing algorithm for all types of slopes
2. Implement area filling algorithms
3. Create and rotate a line about a fixed point and origin.
4. Create and rotate a triangle about the origin and a fixed point.
5. Draw a color cube and spin it using OpenGL transformation matrices.
6. Clip a line using Cohen-Sutherland algorithm.
7. Implement polygon clipping algorithm
8. Implement Z-buffer algorithm
9. Implement Painter's algorithm.
10. Implement tweening



VII Semester

Course 17 B : Design and Analysis of Algorithms

Credits -3

Learning Objectives:

To design, develop and analyze algorithms to provide optimal solutions.

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Understand the fundamental concepts of algorithm analysis and design techniques.
2. Apply divide and conquer design techniques for solving problems
3. Analyze the performance of given problem using greedy approach.
4. Analyze the given problem and provide the feasible solution using dynamic programming.
5. Analyze the complexity of a given problem.

UNIT-I

Introduction: Notion of Algorithm, Fundamentals of Algorithmic Problem Solving.

Fundamentals of the Analysis of Algorithm Efficiency: Analysis framework and Asymptotic Notations and Basic Efficiency Classes, Amortized Analysis. Introduction to Brute Force Technique, Exhaustive Search.

UNIT-II

Divide and Conquer: Introduction, Merge sort, Quick sort, Binary Search, Finding Maximum and Minimum, Strassen's Matrix Multiplication

UNIT-III

The Greedy Method: Introduction, Huffman Trees and codes, Minimum Coin Change problem, Knapsack problem, Job sequencing with deadlines, Minimum Cost Spanning Trees, Single Source Shortest paths.

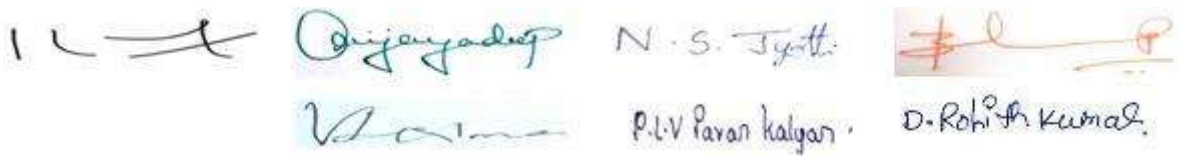
UNIT-IV

Dynamic Programming: Introduction, 0/1 Knapsack problem, All pairs shortest paths, Optimal Binary search trees, Travelling salesman problem.

UNIT-V

Back Tracking: Introduction, n-Queens problem, Sum of subsets, Hamiltonian cycle.

Branch and Bound: Introduction, Assignment problem, Travelling Salesman problem.
Introduction to Complexity classes: P and NP Problems, NP Complete Problems.



Text Books:

1. Fundamentals of computer algorithms, Ellis Horowitz, Sartaj Sahni, S. Rajasekharan, Second Edition, 2008, Universities Press.

Reference Books:

1. Introduction to the Design & Analysis of Algorithms, Anany Levitin, Third Edition, 2011, Pearson Education.
2. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2002, Pearson.

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

Unit 1: Activity: Algorithm Design Contest.

Evaluation Method: Written exam, assessing understanding and application of algorithmic concepts

Unit 2: Activity: Seminar on Divide and Conquer Problem & Solutions.

Evaluation Method: Presentation, Concept Depth, Suitable Applications in real world domain

Unit 3: Activity: Greedy Algorithm Simulation

Evaluation Method: Simulation exercise, evaluating problem analysis and greedyapproach

Unit 4: Activity: Algorithm Visualization

Evaluation Method: Visual representation of algorithms, understanding, presentation and communication skills

Unit 5: Activity: Quiz on complexity analysis concepts

Evaluation Method: Understanding the Complexity classes and problem Analysis

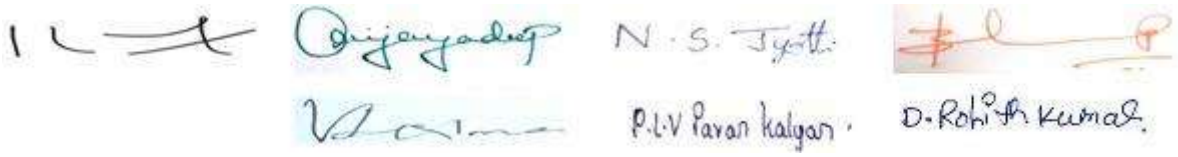
VII Semester

Course 17 B : Design and Analysis of Algorithms using Java / Python C

Credits -1

List of Experiments:

1. Write a program to implement Merge Sort and analyze its performance.
2. Write a program to implement Quick Sort and analyze its performance.
3. Write a program to find the minimum and maximum in a list of elements and analyze it's performance.
4. Write a program to implement Minimum Cost Spanning Trees and analyze its performance.
5. Write a program to implement Single source shortest path algorithm and analyze its performance.
6. Write a program to implement All pairs shortest path algorithm and analyze its performance.
7. Write a program to implement 0/1 knapscak problem and analyze its performance.
8. Write a program to implement n-Queens problem and analyze its performance.
9. Write a program to implement sum of subsets problem and analyze its performance.
10. Write a program to implement Travelling Sales man problem using Branch and Bound approach and analyze its performance.



VII Semester

Course 18 A: Principles of Machine Learning

Credits -3

Learning Objectives:
To design, develop and analyze algorithms to provide optimal solutions.

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Understand the features of machine learning to apply on real world problems.
2. Characterize the machine learning algorithms as supervised learning and unsupervised learning, apply and analyze the various algorithms of supervised and unsupervised learning.
3. Analyze the concept of neural networks for learning linear and non-linear activation functions.
4. Identify an appropriate clustering technique to solve real world problems.
5. Choose a suitable machine learning model, implement and examine the performance of the chosen model for a given real world problems.

UNIT-I:

Introduction: What is Machine Learning, Examples of Various Learning Paradigms, Perspectivesand Issues, Version Spaces, Finite and Infinite Hypothesis Spaces, PAC Learning

UNIT -II

Learning a Class from Examples, Linear, Non-linear, Multi-class and Multi-label classification, Generalization error bounds: VC Dimension, **Decision Trees:** ID3, Classification and Regression Trees, Regression: Linear Regression, Multiple Linear Regression, Logistic Regression.

UNIT -III

Neural Networks: Introduction, Perceptron, Multilayer Perceptron, Support vector machines: Linear and Non-Linear, Kernel Functions, K-Nearest Neighbors.

UNIT -IV

Introduction to clustering, Hierarchical: AGNES, DIANA, Partitional: K-means clustering, K- Mode Clustering, Self-Organizing Map, Expectation Maximization, Gaussian Mixture Models, Principal components analysis (PCA)

UNIT -V

Machine Learning in Practice Design, Analysis and Evaluation of Machine Learning experiments, Feature selection Mechanisms, other issues: Imbalanced data, missing values, Outliers.

Text Books:

1. Ethem Alpaydin, Introduction to Machine Learning, MIT Press, Prentice Hall of India, Third Edition 2014

Reference Books:

1. Machine learning, Dr. S. Sridhar and M. Vijaya Lakshmi, Oxford University Press, 2021.
2. Tom Mitchell, Machine Learning, McGraw Hill, 3rd Edition,1997.
3. Sergios Theodoridis, Konstantinos Koutroumbas, Pattern Recognition, Academic Press, 4th edition, 2008, ISBN:9781597492720
4. Charu C. Aggarwal, Data Classification Algorithms and Applications, CRC Press, 2014
5. Charu C. Aggarwal, DATA CLUSTERING Algorithms and Applications, CRC Press, 2014

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

Unit 1: Activity: Case Study of real-world applications of Machine Learning

Evaluation Method: Presentation, Concept Depth, Suitable Applications in real worlddomain

Unit 2: Activity: Seminar on Supervised Machine Learning Algorithms

Evaluation Method: Presentation, Concept Depth, Suitable Applications in real world domain

Unit 3: Activity: Neural Network Activation Function Exploration

Evaluation Method: Hands-on activity, evaluating the understanding and analysis of linear and non-linear activation functions

Unit 4: Activity: Case Study on Clustering

Evaluation Method: Analyzing real-world clustering problems, evaluating the ability to identify and apply appropriate clustering techniques for solving real- world problems

Unit 5: Activity: Project work on Machine Learning Models

Evaluation Method: Real-world project implementation, evaluating the ability to chooseand implement a suitable machine learning model for solving real- world problems

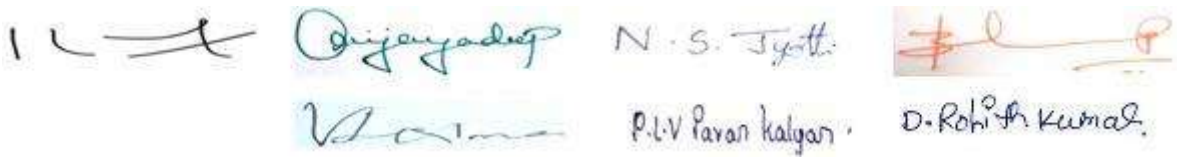
VII Semester

Course 18 A: Principles of Machine Learning Lab using Python / R

Credits -1

List of Experiments:

1. Implement Decision Tree learning.
2. Implement Logistic Regression.
3. Implement classification using Multilayer perceptron.
4. Implement classification using SVM
5. Implement K-means Clustering to Find Natural Patterns in Data.
6. Implement K-mode Clustering
7. Implement Hierarchical clustering.
8. Implement Principal Component Analysis for Dimensionality Reduction.
9. Implement Multiple Correspondence Analysis for Dimensionality Reduction.
10. Implement Gaussian Mixture Model Using the Expectation Maximization
11. Implement k-nearest neighbors' algorithm to classify the iris data set. Print both correctand wrong predictions. Java/Python ML library classes can be used for this problem.
12. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.



VII Semester

Course 18 B: Software Testing

Credits -3

Learning Objectives:

To provide students with a comprehensive understanding of software testing principles, methodologies, and tools, enabling them to effectively design and execute various levels of testing, automate testing processes using Selenium and automation frameworks.

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Understand software testing principles and apply effective test case design strategies.
2. Implement and execute different levels of testing
3. Utilize Selenium for automation testing, including handling web elements and utilizing advanced features.
4. Implement and leverage automation testing frameworks for efficient test automation.
5. Apply TestNG framework for advanced test execution, management, and parallel processing.

UNIT-I

Fundamentals: Software Testing Principals – Tester Role in Software Development Manual Testing and Automation Testing

Introduction to testing design strategies: Test case design strategies – Using black box approachto test case design – Random testing – Equivalence class partitioning – Boundary value analysis –Using white box approach to test design – Test adequacy criteria – Coverage and control flow graphs – Covering code logic – Paths – Their role in white box-based test design

UNIT-II

Levels of Testing: The need for levels of testing – Unit test – Unit test planning – Designing the unit tests – The class as a testable unit – The test harness – Running the unit tests and recording results – Integration tests – Designing integration tests – Integration test planning – System test –The different types – Regression testing – Alpha, beta and acceptance tests

UNIT-III

Selenium Basics: Automation Testing, Introduction to Selenium and its Components, Selenium IDE Features, Selenium Download and Installation, Creating Scripts using Firebug and Its Installation, Locator Types

Selenium WebDriver: Selenium WebDriver Installation with Eclipse, Handling Dropdowns, Explicit and Implicit Wait, Handling Alerts/Pop-ups, Handling Web Tables, Frames, Dynamic Elements, Robot API, AutoIT

UNIT-IV

Selenium Framework: Test Automation Framework: Introduction, Benefits of Automation Framework, Types of Automation framework

UNIT-V

Introduction to TestNG: TestNG Framework, TestNG installation, TestNG Annotations and Listeners, TestNG Example, TestNG Process Execution: Batch, Controlled Batch & Parallel

Text Books:

1. Ilene Burnstein, "Practical Software Testing", Springer International Edition, 2003.
2. Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson education, 2009.
3. Test Automation using Selenium WebDriver with Java: Step by Step Guide by NavneeshGarg
4. Absolute Beginner Java 4 Selenium Webdriver: Come Learn How to Program for Automation Testing by Rex Allen Jones II

Reference Books:

1. Elfriede Dustin, "Effective Software Testing", Pearson Education.
2. Aditya P. Mathur, "Foundations of Software Testing – Fundamental algorithms and techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education

Web Links:

https://www.softwaretestingmaterial.com/types-test-automation-frameworks/ https://www.guru99.com/introduction-to-selenium-grid.html#6

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

Unit 1: Activity: Group discussion on software testing challenges and strategies

Evaluation Method: Assessment of participation and contribution

Unit 2: Activity: Assignment on Creation and execution of unit tests

Evaluation Method: Evaluation of accuracy and coverage of unit tests

Unit 3: Activity: Debugging and troubleshooting of test scripts

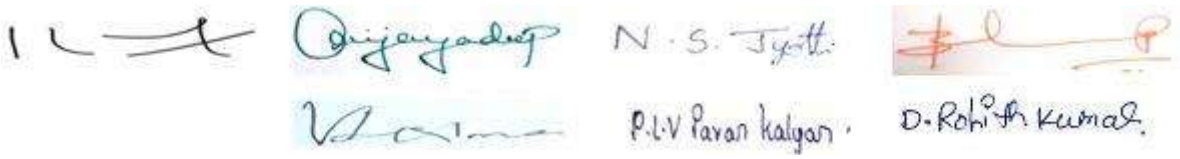
Evaluation Method: Assessment of problem-solving skills

Unit 4: Activity: Case Study on Analysis and optimization of automated test execution forefficiency

Evaluation Method: Assessment of performance improvement and resource usage

Unit 5: Activity: TestNG report generation and analysis

Evaluation Method: Assessment of report accuracy and insights



VII Semester

Course 18 B: Software Testing Lab using Selenium

Credits -1

List of Experiments:

1. Study of software testing tools such as Rational Rose Test Suite, Selenium Tool
2. Installation and exploring the Selenium IDE
3. Write a script to open google.com and verify that title is Google and verify that it is redirected to google.co.in
4. Write a script to open google.co.in using chrome browser (ChromeDriver)
5. Write a script to open google.co.in using internet explorer (InternetExplorerDriver)
6. Write a script to create browser instance based on browser name
7. Write a script to search for specified option in the listbox
8. Write a script to print the content of list in sorted order.
9. Write a script to print all the options. For duplicates add entry only once. Use HashSet.
10. Write a script to close all the browsers without using quit() method.
11. Write generic method in selenium to handle all locators and return web element for any locator.
12. Write generic method in selenium to handle all locators containing dynamic wait and returnweb element for any locator.

VII Semester

Skill based Course 19 A: Advanced Java Programming

Credits -3

Learning Objectives:

To provide students with a comprehensive understanding of Java Enterprise Edition (J2EE) and its associated technologies for developing robust and scalable web applications.

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Understand the multi-tier architecture of J2EE and its implementation in enterprise applications.
2. Develop web applications using Java Servlets and establish database connectivity with JDBC.
3. Create dynamic and interactive web pages using Java Server Pages (JSP) and implementJSP with beans and custom tag libraries.
4. Build enterprise applications using Enterprise Java Beans (EJB) and understand their deployment and configuration.
5. Utilize various Java technologies such as JavaMail, CORBA, and Java RMI for effective communication and distributed computing.

UNIT –I

J2EE Overview & Multi-tier Architecture: Overview of J2SE, J2EE, Advantages of Java, Birthof J2EE, Why J2EE; Distributed Systems, The Tier, J2EE Multi-tier architecture,Implementation of Client-tier, Web-tier, EJB-tier, and EIS-tier, Challenges; J2EE best practices: Enterprise Application Strategy, The Enterprise Application - Client, Session Management, Web-tier and JSPs, EJB-tier, MVC, The Myth of Using Inheritance, Maintainable Classes, Performance Enhancement, Power of Interfaces, Threads, and Notification

UNIT –II

Java Servlets & JDBC: Overview of HTML, XML, and XHTML, Java and XML, Parsing XML,Java Servlets and CGI Programming, A Simple Java Servlet, Anatomy of Servlet, Life Cycle of the Servlet, Deployment Descriptor, Reading data from client, reading HTTP requestheaders, working with cookies, Tracking sessions. Overview of JDBC, JDBC Drivers, JDBC Packages, JDBC Process, Database Connection, Statement, ResultSet, Transaction

Processing, Servlet program with JDBC.

UNIT –III

Java Server Pages: Overview of JSP, JSP versus Servlet, JSP Tags: Variables and Objects, Directives, Scripting Elements, Standard Actions, Implicit Objects, Scope, Java Server Pages with Beans, Tomcat, User Sessions, Cookies, Session Objects, JSP with JDBC, Creating Custom JSP Tag Libraries.

UNIT –VI

Enterprise Java Beans: The EJB Container, EJB Classes, EJB Interfaces and Deployment Descriptions: Anatomy, Environment elements, referencing EJB, Sharing resources, Security elements, Query elements, Relationship elements, Assembly elements. Session Java Beans - stateless vs stateful, Entity Java Beans - Container-managed persistence, Bean-managed persistence. Message- driven Beans, JAR, WAR, EAR Files.

UNIT –V

JavaMail, CORBA and RMI: JavaMail API and Java Activation Framework, Protocols, Exceptions, Send Email Message, Retrieving Email Messages, Deleting Email Message. CORBA : The Concept of Object Request Brokerage, Java IDL and CORBA, The IDL Interface. Java RMI: Remote Method Invocation Concept, Server Side, and Client Side

Text Books:

1. im Keogh: J2EE : The Complete Reference. Mc Graw Hill
2. H. Schildt: Java 2: The Complete Reference. Mc Graw Hill

Reference Books:

1. Kogent Solutions Inc.: Java Server Programming Java EE 7 (J2EE 1.7), Black Book, Dreamtech Press
2. Subrahmanyam Allaramaju et al.: Professional JSP J2EE 1.3 Edition. Wrox Press
3. K. Qian et al.: Java Web Development Illuminated. Narosa
4. Robert W. Sebesta: Programming the World Wide Web. Pearson

N. S. Jyothi P.L.V Pavan Kalyan D. Rohith Kumar

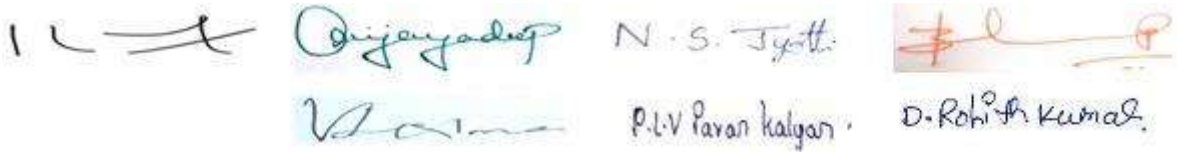
VII Semester

Skill Based Course 19 A: Advanced Java Programming

Credits -1

List of Experiments:

1. Study of software testing tools such as Rational Rose Test Suite, Selenium Tool
2. Write a Java program to retrieve the information from the given URL?
3. Write a java Program to create a servlet to read information from client Registration page
4. Write a java Program to create a JSP page to display a simple message along with currentDate
5. Write a java Program to create a User request page in JSP
6. Write the following (JDBC)
    a. Connect database to Java program
    b. Program to create database table using Java
    c. Program to insert, update, delete & select records
    d. Program to delete record from database
    e. Program to execute batch of SQL statements
    f. Program to execute SQL select query
7. Write the following (EJB)
    a. Create stateless bean component
    b. Create stateless bean client
8. JavaMail Example - Send Mail in Java using SMTP
9. Java RMI - Create and execute the server application program



VII Semester

Skill based Course 19 B: MEAN Stack Development

Credits -3

Learning Objectives:

To provide students with the knowledge and skills necessary to develop web applications using modern web development frameworks and technologies, including JavaScript, Node.js, Express, MongoDB, and AngularJS.

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Gain a comprehensive understanding of web development frameworks, JavaScript fundamentals, and DOM manipulation.
2. Develop proficiency in creating Node.js applications, handling data I/O operations, and utilizing events and callbacks.
3. Build RESTful services using Node.js and Express framework, mastering HTTP handlingand routing.
4. Acquire knowledge and skills in working with MongoDB, performing CRUD operations,and utilizing Mongoose for database integration.
5. Learn to build single-page applications (SPAs) using AngularJS, implementing two-waydata binding and MVC architecture.

UNIT-I

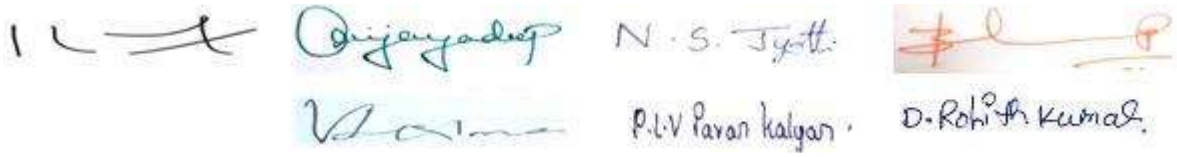
Basic Web Development Framework, Node.js-to-Angular Stack Components

JavaScript Primer: Defining Variables, Understanding JavaScript Data Types, Operators, Looping, Creating Functions, Variable Scope, JavaScript Objects, Manipulating Strings, Workingwith Arrays, Adding Error Handling, Events and Document Object Model, HandlingJSON data, Understanding JSON Callbacks.

UNIT-II

Learning Node.js: Getting Started with Node.js, Understanding Node.js, Installing Node.js, Working with Node Packages, Concurrency and event loop fundamentals, Creating a Node.js Application, Using Events, Listeners, Timers, and Callbacks in Nodes.js: Node.js Event Model, Adding Work to the Event Queue, Implementing Callbacks.

Handling Data I/O in Node.js: Working with JSON, Using the Buffer Module to Buffer Data, Using the Stream Module to Stream Data, Compressing and Decompressing Data with Zlib



UNIT-III

Understanding HTTP Services in Node.js: Processing URLs, Processing Query Strings and Form Parameters, Understanding Request, Response, and Server Objects. Implement HTTP Clients and Servers in Node.Js

Building REST services using Node JS REST services, Installing Express JS, Express Node project structure, Building REST services with Express framework, Routes, filters, template engines – Jade, ejs.

UNIT-IV

Understanding NoSQL and MongoDB: Why NoSQL? , Understanding MongoDB, MongoDB Data Types, MongoDB Basics and Communication with Node JS Installation, CRUD operations, Sorting, Projection, Aggregation framework, MongoDB indexes, Connecting to MongoDB with Node JS, Introduction to Mongoose, Connecting to MongoDB using mongoose, Defining mongoose schemas, CRUD operations using mongoose.

UNIT-V

Building Single Page Applications with AngularJS Single Page Application – Introduction, Two-way data binding(Dependency Injection), MVC in Angular JS, Controllers, Getting userinput, Loops, Client side routing – Accessing URL data, Various ways to provide data in Angular JS – Services and Factories, Working with filters, Directives and Cookies, The digestloop and use of

$apply.

Text Books:

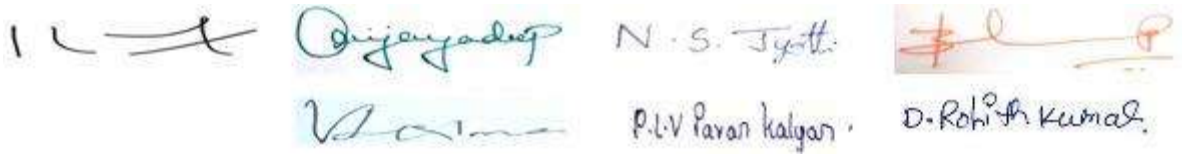
1. Simon Holmes , “Getting MEAN with Mongo, Express, Angular, and Node”, Second Edition, Manning Publications; 1 edition
2. Node.js, MongoDB and Angular Web Development, Brad Dayley, Brendan Dayley, Caleb Dayley, Pearson Education Inc., 2nd Edition, 2018

Reference Books:

1. Jeff Dickey, “Write Modern Web Apps with Mean Stack”, Peachpit press, 2015
2. Ken Williamson, “Learning Angular JS”, O′Reilly; 1 edition
3. Mithun Satheesh, “Web development with MongoDB and Node JS”, Packt Publishing Limited; 2nd Revised edition.

SUGGESTED CO-CURRICULAR ACTIVITIES

1. Training of students by related industrial experts.
2. Assignments
3. Seminars, Group discussions, Quiz, Debates etc.(on related topics).
4. Building chat application using web socket.
5. Build real time dashboard in MEAN stack using websocket
6. Develop a CURD APP for College Student Database



VII Semester

Skill based Course 19 B: MEAN Stack Development

Credits -1

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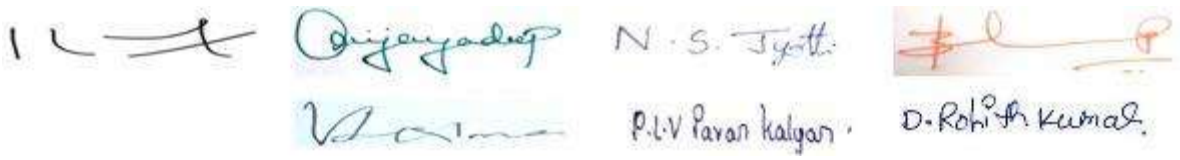
1. Installing the Node.js and its dependencies
2. Creating a Node.js application
3. Implementing http services in Node.js
4. Implementing socket services in Node.js
5. Create registration and login forms with validations using Jscript query
6. Jscript to retrieve student information from student database using database connectivity.
7. Building MongoDB environment and managing collection
8. Manipulating MongoDB documents from Node.js
9. Develop and demonstrate Invoking data using Jscript from Mongo DB.
10. Implementing Express in Node.js
11. Implement the following in Angular JS
    a. Angular JS data binding.
    b. Angular JS directives and Events.
    c. Using angular JS fetching data from MySQL.
12. Understanding Angular and Creating a basic Angular application
13. Create an Online fee payment form using JScript and MongoDB.



VII Semester

Skill based Course 20 A: Mobile Application Development

Credits -3

Learning Objectives:

To provide students with a comprehensive understanding of mobile application development usingthe Android platform.

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Gain a solid understanding of mobile application development principles
2. Develop proficiency in setting up the Android development environment
3. Acquire the necessary skills to handle and manage Android resources effectively
4. Develop expertise in designing user interfaces by utilizing a wide range of UI widgets
5. Learn various storage techniques in Android and Understand how to integrate web applications

UNIT-I

Mobile Application Development Introduction, advantages, difference between mobile application, Web application and Hybrid Application.

Android Operating System Introduction, Android Versions with Features, A

ndroid Architecture, OHA

UNIT-II

Android Application Development Environment: Introduction of Android Studio, Android SDK, Android Development Tools, Android Virtual Devices, Directory Structure of Android Application, Activity & Application Life Cycle, Anatomy of Android Application, Android Manifest File

UNIT-III

Android Terminologies & Resource handling Terminologies: Context, Activity, Intent,Service, Broadcast Receiver, Fragment

Resources: Working with Different Types of Resources Like String, Dimen, Integer, Drawable, Color, Style, Material Design etc.

Animation: Tween Animation and Frame by Frame Animation

UNIT-IV

UI Widgets: TextView, Button, EditText, CheckBox, RadioButton & RadioGroup, AutoCompleteTextView, Spinner, ImageView, Seekbar, ProgressBar, Dialogs

Android Layouts, Menu and Views Layouts: Linear Layout, Absolute Layout, Frame Layout, Relative Layout, Constraint Layout Creation of Layout Programmatically Menu: Option, Context **Views**: Adapters, ListView, ScrollView, WebView, CardView, RecyclerView

UNIT-V

Android Storage Techniques: Shared Preferences, Files & Directories, SQLite Database Connectivity & Operations, Sharing Data Between Application Using Content Providers.

Web Application Integration Techniques and Android APIs: Introduction of JSON, JSON Parsing, Networking API, Telephony API, Web API, Building and Publishing Application to Online Application Store

Text Books:

1. Lauren Darcey and Shane Conder "Android Wireless Application Development", 2nd Edition, Pearson Education,
2. David Griffiths and Dawn Griffiths, "Head First Android Development: A Brain Friendly Guide", O`Reilly

Reference Books:

1. Mark L Murphy, "Beginning Android", Apress, 2011
2. Prasanna Kumar Dixit, "Android", Vikas Publishing House Pvt Ltd.
3. David Mark, Jack Nutting, Jeff LaMarch, "Beginning iOS 6 Development", Apress

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

Unit 1: Activity: Mobile App Development Workshop

Evaluation Method: Students' understanding through a practical project where they develop a basic mobile application.

Unit II: Activity: Android Studio Setup and Configuration Session

Evaluation Method: Successful installation and configuration of the Android Studio development environment.

Unit III: Activity: Resource Management Challenge

Evaluation Method: Students' ability to efficiently manage and utilize different types of Android resources through a practical exercise or assignment.

Unit IV: Activity: UI Design Competition

Evaluation Method: Creativity, usability, and implementation of UI designs using various UI widgets.

Unit V: Activity: Web Integration Hackathon

Evaluation Method: Functionality, user experience, and successful data sharing between the two components during the hackathon.

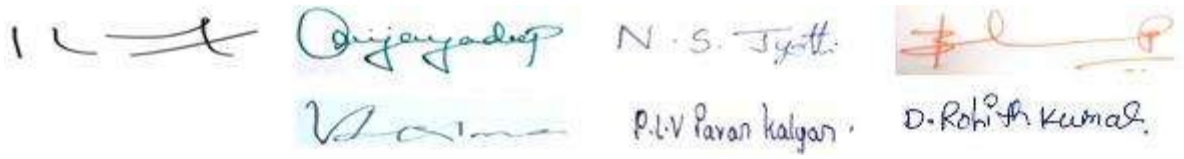
VII Semester

Skill based Course 20 A: Mobile Application Development with Android

Credits -1

List of Experiments:

1. Study of various IDEs for Android development
2. Setting up Android Studio in Windows
3. Develop an application that uses GUI components, Font and Colours
4. Develop an application that uses Layout Managers and event listeners.
5. Write an application that draws basic graphical primitives on the screen.
6. Develop an application that makes use of databases.
7. Develop an application that makes use of Notification Manager.
8. Implement an application that uses multi-threading.
9. Develop a native application that uses GPS location information
10. Implement an application that writes data to the SD card.
11. Implement an application that creates an alert upon receiving a message
12. Write a mobile application that makes use of RSS feed
13. Develop a mobile application to send an email.



VII Semester

Skill based Course 20 B: R Programming

Credits -3

Learning Objectives:

To equip students with the knowledge and skills to effectively use R programming language for data analysis, including data manipulation, visualization, and statistical modeling, enabling them to make data-driven decisions and insights.

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Gain a solid understanding of R programming language
2. Acquire knowledge and skills in manipulating matrices, lists, and data frames, including performing operations and applying functions.
3. Develop the ability to create user-defined functions, handle variable scope, and perform exploratory data analysis, including data preprocessing and descriptive statistics.
4. Learn various data visualization techniques in R, including basic and advanced visualizations, as well as creating 3D plots.
5. Gain proficiency in inferential statistics and regression analysis using R, including simple linear regression and multiple linear regression.

UNIT-I

Introduction to R- Features of R - Environment - R Studio. Basics of R-Assignment - Modes - Operators - special numbers - Logical values - Basic Functions - R help functions - R Data Structures - Control Structures.

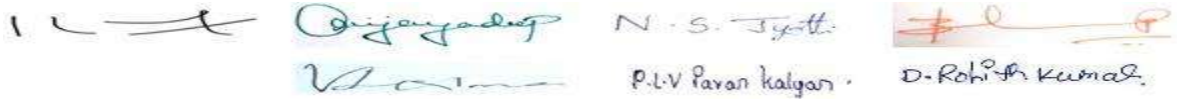
Vectors: Definition- Declaration - Generating - Indexing - Naming - Adding &Removing elements - Operations on Vectors - Recycling - Special Operators - Vectorized if- then else-Vector Equality Functions for vectors - Missing values - NULL values - Filtering & Subsetting.

UNIT-II

Matrices - Creating Matrices - Adding or Removing rows/columns - Reshaping - Operations – Special functions on Matrices.

Lists - Creating List – General List Operations - Special Functions - Recursive Lists.

Data Frames -Creating Data Frames - Naming - Accessing - Adding - Removing - Applying Special functions to Data Frames - Merging Data Frames- Factors and Tables.



UNIT-III

Functions - Creating User-defined functions - Functions on Function Object - Scope of Variables - Accessing Global, Environment -Closures - Recursion.

Input / Output – Reading and Writing datasets in various formats

Exploratory Data Analysis - Data Preprocessing - Descriptive Statistics - Central Tendency - Variability - Mean - Median - Range - Variance - Summary - Handling Missing values and Outliers Normalization

UNIT-IV

Data Visualization in R: Types of visualizations - packages for visualizations - Basic Visualizations, **Advanced Visualizations and Creating 3D plots.**

UNIT-V

Inferential Statistics with R - Types of Learning - Linear Regression- Simple Linear Regression - Implementation in R - functions on lm() - predict() - plotting and fitting regression line.

Multiple Linear Regression - Introduction -comparison with simple linear regression - Correlation Matrix - F- Statistic - Target variables Vs Predictors - Identification of significantfeatures - Implementation of Multiple Linear Regression in R.

Text Books:

1. Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 2014.
2. Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley & Sons, Inc., 2012.
3. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013.

Reference Books:

1. Jure Leskovec, Anand Rajaraman, Jeffrey D.Ullman, "Mining of Massive Datasets",Cambridge University Press, 2014.
2. Nathan Yau, "Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics", Wiley, 2011.

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

Unit 1: Activity: Self Learning through Online resources

Evaluation Method: Online Quiz to access understanding.

Unit II: Activity: Hands-on Lab Session through Datasets

Evaluation Method: Proficiency in manipulating the Datasets.

Unit III: Activity: Data Analysis Competition

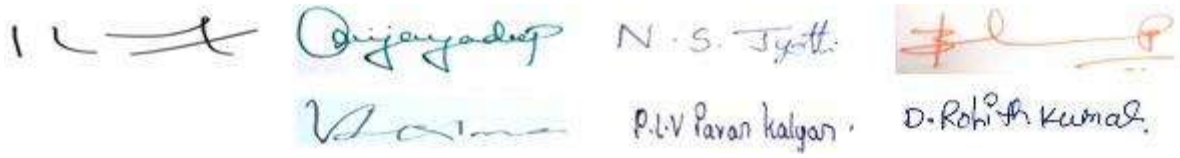
Evaluation Method: Students' ability to preprocess data, application of Descriptive Statistics.

Unit IV: Activity: Infographic Presentation on Data Visualization

Evaluation Method: Clarity, effectiveness, and aesthetics of their created visualizations.

Unit V: Activity: Project Work

Evaluation Method: Ability to apply the learnt knowledge.



VII Semester

Skill based Course 20 B: R Programming

Credits -1

List of Experiments

1. Installing R and R studio
2. Installing the "ggplot2", "caTools", "CART" packages and load the packages "ggplot2", "caTools".
3. Basic operations in R
4. Working with Vectors:
    a. Create a vector v1 with elements 1 to 20.
    b. Add 2 to every element of the vector v1.
    c. Divide every element in v1 by 5
    d. Create a vector v2 with elements from 21 to 30. Now add v1 to v2.
5. Getting data into R, Basic data manipulation
6. Using the data present in the table given below, create a Matrix "M" also Find the pairs of cities with shortest distance.

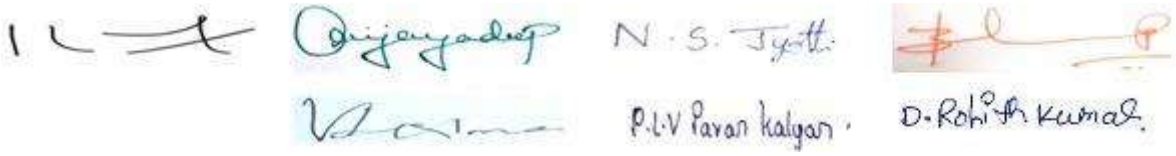
	C1	C2	C3	C4	C5
C1	0	12	13	8	20
C2	12	0	15	28	88
C3	13	15	0	6	9
C4	8	28	6	0	33
C5	20	88	9	33	0

7. Consider the following marks scored by the 6 students

Section	Student no	M1	M2	M3
A	1	45	54	45
A	2	34	55	55
A	3	56	66	64
B	1	43	44	45
B	2	67	76	78
B	3	76	68	37

    a. Create a data structure for the above data and store in proper positions with proper names
    b. Display the marks and totals for all students
    c. Display the highest total marks in each section.
    d. Add a new subject and fill it with marks for 2 sections.

8. Loops and functions - Find the factorial of a given number
9. Implementation of Data Frame and its corresponding operators and functions
10. Implementation of Reading data from the files and writing output back to the specified file
11. Treatment of NAs, outliers, Scaling the data, etc
12. Applying summary() to find the mean, median, standard deviation, etc
13. Implementation of Visualizations - Bar, Histogram, Box, Line, scatter plot, etc.
14. Implementation of Linear and multiple Linear Regression
15. Fitting regression line



VIII Semester

Course 21 A: Big Data Technologies

Credits -3

Learning Objectives:

To provide students with a comprehensive understanding of Big Data technologies, including Apache Hadoop, Hive, HBase, and Zookeeper, and develop practical skills in data processing, querying, and analytics for large-scale datasets.

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Understand the importance and challenges of Big Data, including its classification and applications.
2. Familiarize with Apache Hadoop and learn data movement and MapReduce algorithms.
3. Explore Hadoop architecture, including HDFS, MapReduce tasks, and cluster setup.
4. Develop skills in Hive and HiveQL for querying and analyzing data in Hadoop.
5. Gain proficiency in HBase, including schema design, advanced indexing, and working with Zookeeper for cluster monitoring.

UNIT- I

INTRODUCTION TO BIG DATA: Introduction – Classification of digital data: Structured, Semi structured and unstructured data, Big Data and its importance, Four V's in Big data, Driversfor Big data, Challenges of Big data, Big data analytics and Big data applications.

UNIT- II

INTRODUCTION HADOOP: Big Data – Apache Hadoop & Hadoop Ecosystem – Moving Datain and out of Hadoop – Understanding inputs and outputs of MapReduce - Algorithms using mapreduce, Matrix-Vector Multiplication by Map Reduce, Data Serialization.

UNIT- III

HADOOP ARCHITECTURE: Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read., NameNode, Secondary NameNode, and

DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, TaskTrackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering – Monitoring & Maintenance.

UNIT-IV

HIVE AND HIVEQL: Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting and Aggregating, Map Reduce Scripts, Joins & Subqueries

UNIT-V

HBase concepts- Advanced Usage, Schema Design, Advance Indexing - Zookeeper - how it helpsin monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.

Text Books:

1. Big Data Black Book (Covers Hadoop 2, Map Reduce, Hive, Yarn, Pig & Data Visualization) - Dream Tech Publications
2. Big data and Analytics - Seema Acharya and Subhashini Chellappan - Wiley publications.

Reference Books:

1. "Understanding Big data", Chris Eaton, Dirk deroos et al., McGraw Hill, 2012.
2. "Big Data Analytics", G. Sudha Sadasivam and R. Thirumahal, Oxford University Press 2020.
3. "HADOOP: The definitive Guide" , Tom White, O Reilly 2012.
4. "Big Data Analytics with R and Haoop", Vignesh Prajapati, Packet Publishing 2013.
5. "Oracle Big Data Handbook", Tom Plunkett, Brian Macdonald et al, Oracle Press, 2014.

SUGGESTED CO-CURRICULAR ACTIVITIES:

1. Arrange expert lectures by IT experts working professionally in the area of Big data
2. Assignments
3. Seminars, Group discussions, Quiz, Debates etc.
4. Presentation by students on various applications of Big data.
5. Problem solving exercises.

VIII Semester

Course 21A: Big Data Technologies

Credits -1

List of Experiments:

1. HDFS: Setup a hdfs in a single node to multi node cluster, perform basic file system operation on it using commands provided, monitor cluster performance
2. Write various Map Reduce programs to count the number of times a single word has occurred in a given paragraph.
3. Implement the following file management tasks in Hadoop:
    a. Adding files and directories, List the files and directories
    b. Retrieving files Deleting files
    c. Copying files from one folder to another in HDFS
    d. Copying files from Local File System to HDFS
4. Write a Map Reduce program to add two matrices.
5. Write a Map Reduce program to multiply a matrix with a Vector.
6. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm
7. Write a Map Reduce program that mines weather data (NCDC). Weather sensors collectingdata every hour at many locations across the globe gather a large volume of log data, whichis a good candidate for analysis with MapReduce, since it is semi structured and record- oriented. (Data available at: ftp://ftp.ncdc.noaa.gov/pub/data/noaa/.)
8. Find average, max and min temperature for each year in NCDC data set
9. Stop word elimination problem:

    Input: 1. A large textual file containing one sentence per line

    2. A small file containing a set of stop words (One stop word per line)
    Output:

    1. A textual file containing the same sentences of the large input file without the words appearing in the small file.
10. Write a MapReduce Application to implement Combiners
11. Write a MapReduce Application to implement Reduce-side Join
12. Write a MapReduce Application to implement Map-side Join
13. Hbase: Setup of Hbase in single node and distributed mode, write program to write somedata into hbase and query it

VIII Semester

Course 21 B : Compiler Design

Credits -3

Learning Objectives:

To provide students with a comprehensive understanding of compiler design principles and techniques, including lexical analysis, syntax analysis, intermediate code generation, error handling, storage organization, code generation, and optimization..

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Understand the compiler structure and the process of lexical analysis using finite automata.
2. Acquire knowledge of syntax analysis techniques, including recursive descent parsing, predictive parsing, and LR parsing.
3. Learn about syntax-directed translation, intermediate code generation, and error detectionand recovery methods in compilers.
4. Explore storage organization, dynamic storage allocation, error recovery methods, andcode generation issues in compilers.
5. Develop an understanding of code optimization techniques, machine-dependent optimization, register allocation, and machine-independent optimization in compilers.

UNIT-I

Overview of the Compiler and its Structure: Language processor, Applications of language processors, Definition-Structure-Working of compiler, the science of building compilers, Difference between interpreter and compiler. Compilation of source code into target language, Types of compilers

Lexical Analysis: The Role of the Lexical Analyzer, Specification of Tokens, Recognition of Tokens, Input Buffering, elementary scanner design and its implementation (Lex), Applying concepts of Finite Automata for recognition of tokens.

UNIT-II

Syntax Analysis: Understanding Parser and CFG (Context Free Grammars), Role of Parser, ParseTree -Elimination of Ambiguity, Left Recursion and Left Factoring of grammar

Syntax Analysis-Top Down: Top Down Parsing - Recursive Descent Parsing - Non Recursive Descent Parsing - Predictive Parsing - LL (1) Grammars.

Syntax Analysis-Bottom Up: Shift Reduce Parsers- Operator Precedence Parsing -LR Parsers, Construction of SLR Parser Tables and Parsing, CLR Parsing, LALR Parsing

UNIT-III

Syntax Directed Definition – Evaluation Order - Applications of Syntax Directed Translation- Syntax Directed Translation Schemes - Implementation of L attributed Syntax Directed Definition. **Intermediate Code Generation:** Variants of Syntax trees - Three Address Code- Types – Declarations - Procedures - Assignment Statements - Translation of Expressions - Control Flow- Back Patching- Switch Case Statements.

UNIT-IV

Error Recovery Error Detection & Recovery, Ad-Hoc and Systematic Methods Source Language Issues, Storage Organization. Stack Allocation of Space, Access to Nonlocal Data on the Stack, Parameter Passing; Symbol Tables; Language Facilities for Dynamic Storage Allocation; Dynamic Storage Allocation Techniques, Heap Management

UNIT-V

Code Generation: Issues in the Design of a Code Generator, the Target Language, Addressesin the Target Code, Basic Blocks and Flow Graphs,

Code Optimization: Optimization of Basic Blocks, A Simple Code Generator, Machine dependent optimization, Register Allocation and Assignment; The DAG Representation of Basic Blocks; Peephole Optimization; Generating Code from DAGs; Design of specifications for compilers, Machine independent optimization Error detection of recovery

Text Books:

1. A. V. Aho, Monica S. Lam, Ravi Sethi and Jeffrey D. Ullman, Compilers: Principles, techniques, &tools, Second Edition, Pearson Education, 2007.
2. K. D. Cooper and L. Torczon, Engineering a compiler, Morgan Kaufmann, 2nd edition, 2011.

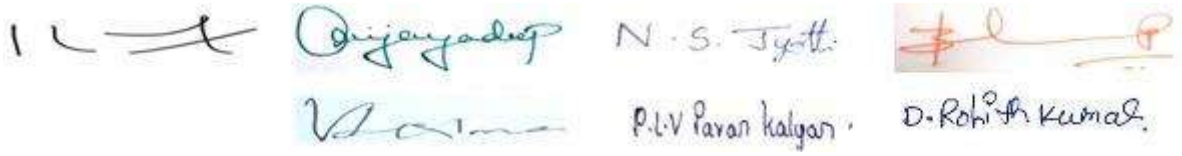
3. Steven S.Muchnick, Advanced Compiler design implementation" Elsevier Science India, 2003.
4. Compiler Design by Muneeswaran, Oxford University Press

Reference Books:

1. Andrew A.Appel , Modern Compiler Implementation in Java, Cambridge University Press; 2ndedition, 2002.
2. Allen Holub, Compiler Design in C, Prentice Hall, 1990
3. TorbengidiusMogensen, Basics of Compiler Design, Springer, 2011.
4. Charles N, Ron K Cytron, Richard J LeBlanc Jr., Crafting a Complier, Pearson Education, 2010.

SUGGESTED CO-CURRICULAR ACTIVITIES:

1. Training of students by related industrial experts.
2. Assignments
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Presentation by students on Online Compilers and its Architecture
5. Implement the back end of the compiler which takes the three-address code and produces the 8086 assembly language instructions that can be assembled and run using an 8086 assembler. The target assembly instructions can be simple move, add, sub, jump etc.



VIII Semester

Course 21 B: Compiler Design

Credits -1

List of Experiments:

1. Implementation of a Lexical Analyzer using tools like Flex or Lex to recognize and tokenize input programs.
2. Building a Syntax Analyzer using a parser generator like Bison or YACC to verify the syntactical correctness of the input program.
3. Write a LEX program to recognize valid arithmetic expression. Identifiers in the expression could be only integers and operators could be + and *. Count the identifiers & operators present and print them separately.
4. Write a LEX program to eliminate comment lines in a C program and copy the resulting program into a separate file
5. Write YACC program to recognize all strings for which starts with ‘n’ number of ‘a’s followed by n number of ‘b’s.
6. Write YACC program to recognize valid identifier, operators and keywords in the given text (C program) file.
7. Implementation of calculator using lex and YACC.
8. Write a C Program to develop an operator precedence parser for a given language.
9. Convert the BNF rules into YACC form and write code to generate abstract syntax tree.
10. Construct a recursive descent parser for an expression.
11. Construct a Shift Reduce Parser for a given language.
12. Implement Intermediate code generation for simple expressions

VIII Semester

Course 22 A: Data Mining Concepts and Techniques

Credits -3

Learning Objectives:

To provide students with a thorough understanding of data warehousing and data mining concepts, techniques, and applications.

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Understand data warehousing concepts, including data warehouse architecture, multidimensional data models, and OLAP operations.
2. Explore the fundamentals of data mining, including its definition, techniques, andapplications in real-world scenarios.
3. Develop knowledge and skills in clustering techniques, including partitioning algorithms, hierarchical clustering, and categorical clustering.
4. Acquire proficiency in decision tree construction and the use of decision tree algorithmsfor data analysis and prediction.
5. Gain exposure to various advanced data mining techniques, such as neural networks, genetic algorithms, and text mining, including web mining concepts and applications.

UNIT - I

Data Warehousing: Introduction, What is Data Warehouse? Definition, Multidimensional Data Model, **OLAP** Operations, Warehouse Schema, Data Warehouse Architecture, Warehouse Server, Metadata, OLAP Engine, Data Warehouse Backend Process, Other Features
Data Pre-processing, Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation

UNIT - II

Data Mining: What is Data Mining? Data Mining: Definitions, KDD vs Data Mining, DBMS vs DM, Other Related Areas, DM Techniques, Other Mining Techniques, Issues and Challenges in DM, DM Applications- Case Studies

Association Rules: What is an Association Rule? Methods to Discover Association Rules,

APriori Algorithm, Partition Algorithm, Pincer-Search Algorithm, Dynamic Itemset Counting Algorithms,FP- Tree Growth Algorithm, Discussion on Different Algorithms, Incremental Algorithms, Border Algorithms, Generalized Association Rule, Association Rules with Item Constraints

UNIT - III

Clustering Techniques: Clustering Paradigms, Partitioning Algorithms, k-Medoid Algorithms, CLARA, CLARANS, Hierarchical Clustering, DBSCAN, BIRCH, CURE, Categorical Clustering Algorithms, STIRR, ROCK, CACTUS

UNIT – IV

Decision Trees: What is a Decision Tree? Tree Construction Principle, Best Split, Splitting Indices, Splitting Criteria, Decision Tree Construction Algorithms, CART, ID3, C4.5, Decision Tree Construction with Presorting, Rainforest, Approximate Methods, CLOUDS, BOAT, Pruning Techniques, Integration of Pruning and Construction, Ideal Algorithm

UNIT – V

Other Techniques: What is a Neural Network? Learning in NN, Unsupervised Leaning, Data Mining Using NN: A Case Study, Genetic Algorithms, Rough Sets, Support Vector Machines
Web Mining: Web Mining, Web Content Mining, Web Structure Mining, Web Usage Mining, Text Mining, Unstructured Text, Episode Rule Discovery for Texts, Hierarchy of Categories, Text Clustering

Text Books:

1. Data Mining Techniques, Arun K Pujari, University Press
2. Data Mining: Concepts and Techniques, 3rd Edition, Jiawei Han, Micheline Kamber, JianPei

SUGGESTED CO-CURRICULAR ACTIVITIES:

1. Arrange expert lectures by IT experts working professionally in the area of Big data
2. Assignments
3. Seminars, Group discussions, Quiz, Debates etc.
4. Presentation by students on various applications of Data Mining.
5. Problem solving exercises.

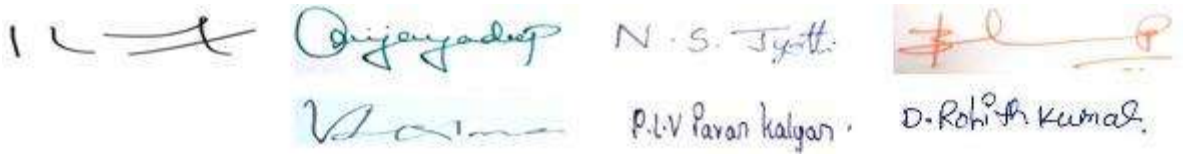
VIII Semester

Course 22 A: Data Mining Concepts and Techniques

Credits -1

List of Experiments:

1. Study of various Open-Source Data Mining Tools
2. Build Data Warehouse and Explore WEKA
3. Perform data preprocessing tasks and Demonstrate
4. Perform association rule mining on data sets
5. Demonstrate performing classification on data sets
6. Demonstrate performing clustering on data sets
7. Demonstrate performing Regression on data sets
8. Credit Risk Assessment. Sample Programs using German Credit Data
9. Sample Programs using Hospital Management System



VIII Semester

Course 22 B : Digital Image Processing

Credits -3

Learning Objectives:

To provide students with a comprehensive understanding of digital image processing concepts, techniques, and applications.

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Understand digital image processing fundamentals and applications in various domains.
2. Develop skills in spatial domain image enhancement techniques
3. Acquire proficiency in frequency domain image enhancement
4. Master in image segmentation techniques
5. Learn image compression principles.

UNIT-I

Introduction: Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Sampling and Quantization, Representing Digital Images (Data structure), Some Basic Relationships between Pixels- Neighbors and Connectivity of pixels in image, Applications of Image Processing: Medical imaging, Robot vision, Character recognition, RemoteSensing.

UNIT -II

Image Enhancement in The Spatial Domain: Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial EnhancementMethods.

UNIT -III

Image Enhancement in Frequency Domain: Introduction, Fourier Transform, Discrete Fourier Transform (DFT), properties of DFT, Discrete Cosine Transform (DCT), Image filtering in frequency domain.

UNIT -IV

Image Segmentation: Introduction, Detection of isolated points, line detection, Edge detection, Edge linking, Region based segmentation- Region growing, split and merge technique, local processing, regional processing, Hough transform, Segmentation using Threshold.

UNIT -V

Image Compression: Introduction, coding Redundancy, Inter-pixel redundancy, image compression model, Lossy and Lossless compression, Huffman Coding, Arithmetic Coding, LZW coding, Transform Coding, Sub-image size selection, blocking, DCT implementation using FFT, Run length coding.

Text Books:

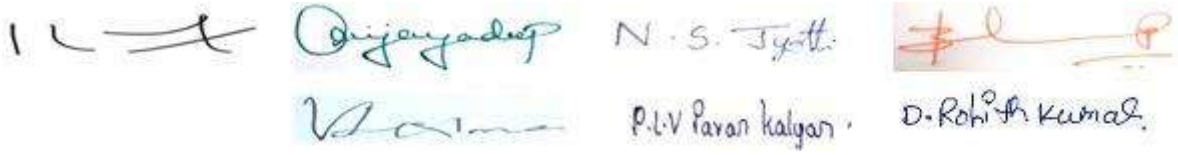
1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar, " Digital Image Processing", TataMcGraw- Hill Education, 2011.

Reference Books:

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009.

SUGGESTED CO-CURRICULAR ACTIVITIES:

1. Arrange expert lectures in the area of Image Processing.
2. Assignments related to medical image processing, character recognition, signature recognition, remote sensing image processing, etc.
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Presentation by students on recent trends of Image processing.



VIII Semester

Course 22 B: Digital Image Processing

Credits -1

List of Experiments:

1. Simulation and Display of an Image, Negative of an Image (Binary & Gray Scale)
2. Implementation of Relationships between Pixels.
3. Implementation of Transformations of an Image
4. Contrast stretching of a low contrast image, Histogram, and Histogram Equalization
5. Display of bit planes of an Image
6. Display of FFT(1-D & 2-D) of an image
7. Computation of Mean, Standard Deviation, Correlation coefficient of the given Image
8. Implementation of Image Smoothening Filters(Mean and Median filtering of an Image)
9. Implementation of image sharpening filters and Edge Detection using Gradient Filters
10. Image Compression by DCT,DPCM, HUFFMAN coding
11. Implementation of image restoring techniques
12. Implementation of Image Intensity slicing technique for image enhancement
13. Canny edge detection Algorithm.

VIII Semester

Course 23 A: Information Security and Cryptography

Credits -3

Learning Objectives:

To provide students with a comprehensive understanding of cryptography and network security concepts and their practical applications.

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Demonstrate the knowledge of cryptography, network security concepts and applications.
2. Develop security mechanisms to protect computer systems and networks.
3. Apply security principles in system design.
4. Apply methods for authentication, access control, intrusion detection and prevention.
5. Ability to identify and investigate vulnerabilities and security threats and mechanisms to counter them.

UNIT-I

Information Security: Introduction, History of Information security, What is Security, CIA Traid, CNSS Security Model, Components of Information System, Balancing Information Security and Access, Approaches to Information Security Implementation, The Security Systems DevelopmentLife Cycle.

Security Attacks (Interruption, Interception, Modification and Fabrication), Vulnerability, Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control andAvailability) and Mechanisms.

UNIT-II

Cryptography: Concepts and Techniques, Conventional substitution and transposition ciphers, One- time Pad, Block cipher and Stream Cipher, Symmetric and Asymmetric key cryptography, Steganography

Symmetric key Ciphers: DES structure, DES Analysis, Security of DES, variants of DES, Block cipher modes of operation, AES structure, Analysis of AES, Key distribution.

UNIT-III

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Analysis of RSA, Diffie-Hellman Key exchange, Elliptic Curve Cryptography.

Message authentication and Hash Functions, Authentication Requirements and Functions, Message Authentication, Hash Functions and MACs Hash and MAC Algorithms SHA-512, HMAC. Digital Signatures, Authentication Protocols, Digital signature Standard.

UNIT-IV

Program Security: Secure programs, Non-malicious Program errors, Malicious codes virus, Trap doors, Salami attacks, Covert channels, Control against program.

IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

Email Security: Pretty Good Privacy (PGP) and S/MIME.

UNIT-V

Web Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport LayerSecurity (TLS), Secure Electronic Transaction (SET).

Intruders, Virus and Firewalls: Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls

Wireless Security, Honeypots, Traffic flow security.

Text Book(s)

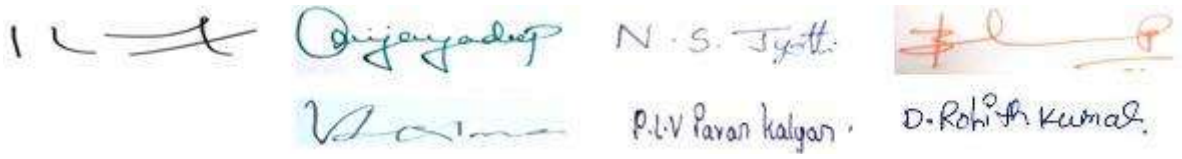
1. **Principles of Information Security**: *Michael E. Whitman, Herbert J. Mattord*, CENGAGE Learning, 4th Edition.
2. **Cryptography And Network Security Principles And Practice**, Fourth or Fifth Edition, *William Stallings*, Pearson
3. **Security in Computing**, Fourth Edition, by *Charles P. Pfleeger*, Pearson Education

Reference Books

1. **Modern Cryptography**: **Theory and Practice**, by *Wenbo Mao*, Prentice Hall.
2. **Network Security Essentials**: **Applications and Standards**, by *William Stallings*.Prentice Hall.
3. **Principles of Information Security**, *Whitman*, Thomson.
4. **Cryptography and Network Security** : *Forouzan Mukhopadhyay*, Mc Graw Hill, 2nd Edition

SUGGESTED CO-CURRICULAR ACTIVITIES:

1. Training of students by related industrial experts.
2. Assignments
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Presentation by students on emerging Cyber frauds
5. Case Studies of Various Cryptographic Algorithms



VIII Semester

Course 23 A: Information Security and Cryptography

Credits -1

List of Experiments:

1. Write a Java Program to implement Ceaser Cipher
2. Write a Java Program to implement Playfair Cipher
3. Write a Java Program to implement Railfence Cipher
4. Write a Java Program to implement Hill Cipher with 2 x 2 Matrix
5. Write a Java Program to implement DES algorithm
6. Write a Java Program to implement RSA algorithm
7. Write a Java Program for Diffie-Hellman Key Exchange
8. Write a Java Program to Generate SHA-512 Hash of a file
9. Write a Java Program to implement Digital Signature with a File
10. Configuring S/MIME for email communication
11. Setup a honeypot and monitor the honeypot on the network
12. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG)
13. Perform wireless audit on an access point or a router and decrypt WEP and WPA (Net Stumbler)
14. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)

VIII Semester

Course 23 B: Mobile Ad hoc and Sensor Networks

Credits -3

Learning Objectives:

To provide students with a comprehensive understanding of ad hoc wireless networks, including their fundamentals, protocols, and security mechanisms.

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Understand the concept of ad-hoc and sensor networks, their applications and typical nodeand network architectures.
2. Describe the MAC protocol issues of ad hoc networks.
3. Identify and describe routing protocols for ad hoc wireless networks with respect to TCP design issues.
4. Explain the concepts of network architecture and MAC layer protocol for WSN.
5. Familiar with the OS used in Wireless Sensor Networks and build basic modules.

UNIT-I

Introduction to Ad Hoc Wireless Networks: Fundamentals of Wireless Communication Technology, The Electromagnetic Spectrum, Radio propagation Mechanisms, Characteristics of the Wireless channel, Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet

UNIT-II

MAC Protocols for Ad Hoc Wireless Networks: Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT-III

Routing Protocols for Ad Hoc Wireless Networks: Issues in Designing a Routing Protocol, Classifications of Routing Protocols-Table driven protocols- Destination Sequenced Distance Vector (DSDV), Wireless Routing Protocol (WRP), On-demand routing protocol-Dynamic Source Routing (DSR), Ad Hoc On-Demand Distance Vector Routing (AODV), Hybrid routing protocols-Zone Routing Protocol (ZRP)

UNIT-IV

Transport layer and Security Protocols for Ad hoc Wireless Networks: Introduction, issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks. Classification of Transport Layer Solutions. TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

Security protocols: Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks, Cooperation in MANETs, Intrusion Detection Systems.

UNIT-V

Basics of Wireless Sensors and Applications: The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High- level application layer support, Hardware-Components of Sensor Mote, Sensor Network OperatingSystems– TinyOS, CONTIKIOS, Node-level Simulators – NS2 and its extension to sensor networks, COOJA, TOSSIM

Text Book(s)

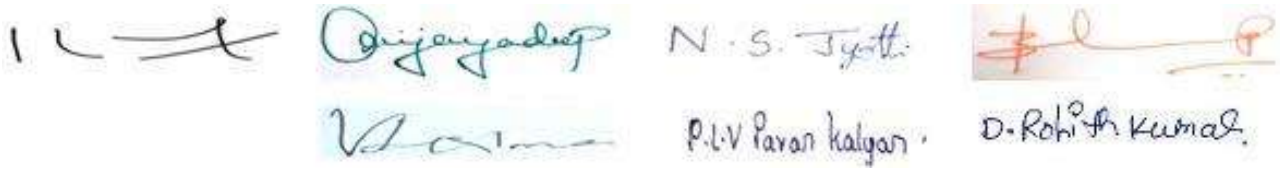
1. *C. Siva Ram Murthy and B. S. Manoj*, "**Ad Hoc Wireless Networks Architectures and Protocols**", Prentice Hall, PTR, 2004.
2. *Holger Karl, Andreas willig*, *"***Protocol and Architecture for Wireless Sensor Networks***"*, John Wiley publication, Jan 2006.

Reference Books

1. *Feng Zhao, Leonidas Guibas*, **"Wireless Sensor Networks: an information processing approach"**, Elsevier publication, 2004.
2. *Charles E. Perkins*, "**Ad Hoc Networking**", Addison Wesley, 2000.
3. I.*F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci*, **"Wireless sensor networks: a survey , computer networks"**, Elsevier, 2002, 394 - 422.

SUGGESTED CO-CURRICULAR ACTIVITIES:

1. Training of students by related industrial experts.
2. Assignments
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Presentation by students on various Network Simulators
5. Case Studies of Various Applications of Ad hoc and Sensor Networks



VIII Semester

Course 23 B: Mobile Ad hoc and Sensor Networks

Credits -1

List of Experiments:

All the experiments should be done on any Network Simulator like NS-2/NS- 2/OMNET++/OPNET etc.

1. Study various network simulators used for wireless Ad-Hoc and Sensor Networks.
2. Introduction to TCL scripting: demonstration of one small Wireless network simulation script.
3. Study various trace file formats of network simulators.
4. Implement and compare various MAC layer protocols.
5. Generate TCL script for UDP and CBR traffic in WSN nodes.
6. Generate TCL script for TCP and CBR traffic in WSN nodes.
7. Implement and compare AODV and DSR routing algorithms in MANET for various parameters.
8. Implement DSDV routing algorithms in MANET.
9. Calculate and compare average throughput for various TCP variants.
10. Implement and compare various routing protocols for wireless sensor networks.
11. Study Ethereal / Wireshark software and analyze dump files.

VIII Semester

Skill based Course 24 A: Advanced Database Management Systems

Credits -3

Learning Objectives:

To provide students with a Through theoretical knowledge and practical application of advanced topics in database management systems.,

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Gain understanding of relational database concepts, functional dependencies, and correctness of FDs.
2. Analyze and apply normalization techniques (3NF, BCNF, 4NF, 5NF)
3. Develop skills in processing joins, grasp materialized vs. pipelined processing
4. Learn principles of correct interleaved execution, locking mechanisms (2PL), handle deadlocks.
5. Acquire knowledge of T/O-based techniques, multi-version approaches

UNIT-I

Formal review of relational database concepts, Functional dependencies, Closure, Correctness of FDs

UNIT-II

3NF and BCNF, 4NF and 5NF, Decomposition and synthesis approaches, Review of SQL99, Basics of query processing, external sorting, file scans

UNIT-III

Processing of joins, materialized vs. pipelined processing, query transformation rules, DB transactions, ACID properties, interleaved executions, schedules, serializability

UNIT-IV

Correctness of interleaved execution, Locking and management of locks, 2PL, deadlocks, multiple level granularity, Concurrency Control on B+ trees, Optimistic Concurrency Control and the concepts related to Global and Local transactions in Distributed transactions.

UNIT-V

T/O based techniques, Multiversion approaches, Comparison of Concurrency Control methods, dynamic databases, Failure classification, recovery algorithm, XML and relational databases

Text Book(s)

1. R. Ramakrishnan, J. Gehrke, Database Management Systems, McGraw Hill, 2004
2. A. Silberschatz, H. Korth, S. Sudarshan, Database system concepts, 5/e, McGraw Hill, 2008.

Reference Books

3. Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom, "Database Systems: TheComplete Book", Pearson, 2011.

SUGGESTED CO-CURRICULAR ACTIVITIES:

1. Performance tuning approaches by subject matter experts
2. Assignments
3. Seminars, Group discussions, Quiz, Debates etc.(on related topics).
4. Creating different kinds of indexes in Oracle and MySQL databases and compare the performance
5. Case study on the need for 2PLand transactional controls

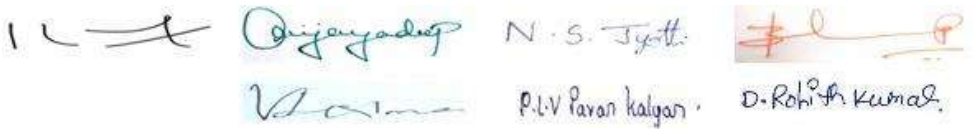
VIII Semester

Skill based Course 24A: Advanced Database Management Systems

Credits -1

List of Experiments:

1. Running Basic SQL commands
2. Understanding the use of Intermediate SQL
3. Running Advanced SQL related to data mining (Slicing and Dicing)
4. Creation of ER and EER diagrams for an organization
5. Database Design and Normalization for a given organization
6. Accessing Databases from Programs using JDBC
7. Analyzing query performance using explain plans
8. Creation of indexes for better query performance.
9. Running different query evaluation plans
10. Experimenting on DBMS locks and session management



VIII Semester

Skill based Course 24 B: Cloud Computing

Credits -3

Learning Objectives:

To provide students with a comprehensive understanding of cloud computing concepts, virtualization technologies, and different service models in the context of cloud computing.

The course will explore the origins, components, and essential characteristics of cloud computing, along with the benefits and limitations associated with its adoption

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Understand the essential characteristics and benefits of cloud computing
2. Gain knowledge of virtualization technologies
3. Explore Microsoft implementation of virtualization and understand different cloud deplo
4. Learn about Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) models,
5. Explore Software as a Service (SaaS) and its service providers.

UNIT-I

Cloud Computing Overview – Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service, Broad network access, Location independent resource pooling, Rapid elasticity, Measured service. **Cloud scenarios** – Benefits: scalability, simplicity, vendors, security. Limitations – Sensitive information - Application development – **Security concerns** - privacy concern with a third party - security level of third party - security benefits Regularity issues: Government policies.

UNIT-II

Virtualization: Virtualization and cloud computing - Need of virtualization – cost, administration,fast deployment, reduce infrastructure cost - limitations

Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization Desktop virtualization: **Software virtualization** – Memory virtualization - Storage virtualization, **Data virtualization** – **Network virtualization**

UNIT-III

Microsoft Implementation: Microsoft Hyper V, VMware features and infrastructure – Virtual Box - Thin client

Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing

UNIT-IV

Infrastructure as a Service (IaaS): IaaS service providers – Amazon EC2, GoGrid, Rack Space, Windows Azure infrastructure services – Amazon EC service level agreement – Recent developments – Benefits

Platform as a Service (PaaS): PaaS service providers – Right Scale – Salesforce.com – Force.com – Oracle APEX cloud - Services and Benefits

UNIT-V

Software as a Service (SaaS): SaaS service providers – Google App Engine, Salesforce.com and google platform – Benefits – Operational benefits - Economic benefits – Evaluating SaaS

Text Book(s)

1. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christenvecctiola, S Tammaraiselvi, TMH

Reference Books

1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter TATA McGraw- Hill , New Delhi - 2010
2. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008
3. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
4. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press
5. AWS, Azure and Saleforceweb tutorials

SUGGESTED CO-CURRICULAR ACTIVITIES:

1. Training of students by Skill Development Centres
2. Hands-on Lab Sessions on Open Public Clouds
3. Assignments, Seminars, Group discussions, Quiz, Debates etc.(on related topics).
4. Case Studies on operations that can be performed on IaaS, PaaS and SaaS providers

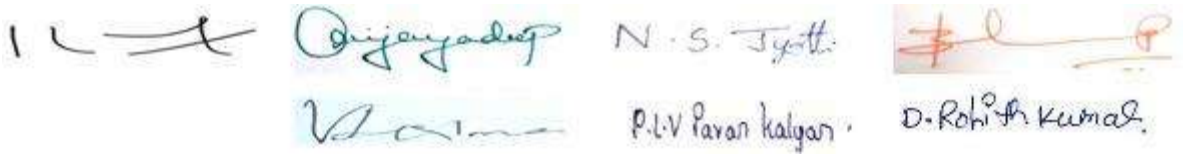
VIII Semester

Skill based Course 24 B: Cloud Computing

Credits -1

List of Experiments:

1. Setup virtual machines on a single computer using VMWare and VirtualBox
2. Create a network using multiple virtual machines on a single host using VMware
3. Setup a client server interaction on a single host using VMware
4. Create an AWS account and create an EC2 instance with a C compiler
5. Connect to EC2 instance and run some C programs on EC2 instance
6. Install a web server on an EC2 instance and provide access to it using Security Group rules
7. Create a virtual cloud on EC2 platform
8. Connect to Force.com and create a data entry form using Salesforce APEX
9. Create a new account on Saleforce.com and create leads, quotes and contracts
10. Analyze the services available on Oracle APEX and create sample web applications



VIII Semester

Skill based Course 25 A: Computer Vision

Credits -3

Learning Objectives:

To equip the students with the knowledge and skills to analyze and interpret images, detect and recognize objects, estimate motion, and apply computer vision techniques in various domains such as biometrics, medical image analysis, surveillance, and augmented reality.

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Understand the fundamental concepts of computer vision and its applications in various domains.
2. Apply color and geometric transforms, edge-detection techniques, filtering, andmathematical operations to analyze images.
3. Comprehend the concept of motion estimation and its applications.
4. Apply shape correspondence, shape matching, principal component analysis, and shape priors for object recognition.
5. Explore various applications of computer vision

UNIT-I

Introduction to Computer Vision: Image Processing, Computer Vision and Computer Graphics, 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-II

Image Representation And Analysis: Image representation, Image processing techniques like color and geometric transforms, Edge-detection Techniques, Filtering, Mathematical operations on image and its applications like convolution, filtering

UNIT-III

Motion Estimation: Introduction to motion, Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion and models

UNIT-IV

Object Recognition: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal component analysis, Shape priors for recognition

UNIT-V

Applications: Photo album, Face detection, Face recognition, Eigen faces, Active appearance and3D shape models of faces Application: Surveillance, foreground background separation, particle filters, Chamfer matching, tracking, and occlusion, combining views from multiple cameras, human gait analysis Application: Invehicle vision system: locating roadway, road markings, identifying road signs, locating pedestrians

Text Book(s)

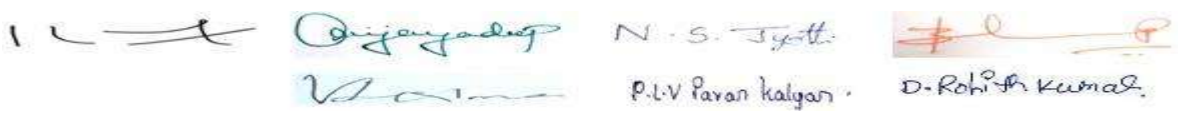
1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall
2. Robot Vision,by B. K. P. Horn, McGraw-Hill.
3. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012

Reference Books

1. Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall.
2. D. H. Ballard, C. M. Brown. Computer Vision. Prentice-Hall, Englewood Cliffs.
3. Richard Szeliski, Computer Vision: Algorithms and Applications (CVAA). Springer, 2010
4. Image Processing, Analysis, and Machine Vision. Sonka, Hlavac, and Boyle. Thomson.
5. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012

SUGGESTED CO-CURRICULAR ACTIVITIES:

1. Student Seminar on Applications of Computer Vision
2. Hands-on Lab Sessions on Computer Vision Techniques
3. Assignments, Seminars, Group discussions, Quiz, Debates etc.(on related topics).
4. Project Work



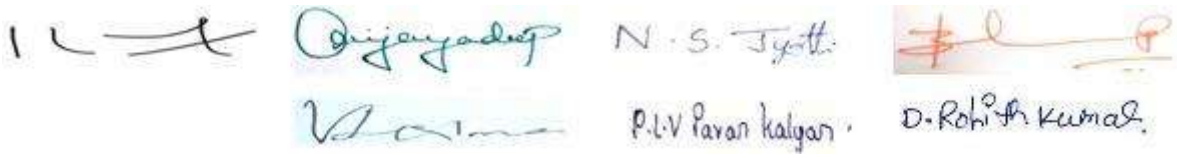
VIII Semester

Skill based Course 25 A: Computer Vision with OpenCV

Credits -1

List of Experiments:

1. Import libraries
2. RGB image and resizing
3. Grayscale image
4. Image denoising, Image thresholding, Image gradients
5. Edge detection fourier transform on image
6. Line transform
7. Corner detection
8. Morphological transformation of image, Geometric transformation of image
9. Contours
10. Image pyramids
11. Color space conversion and object tracking
12. Interactive foreground extraction
13. Image segmentation, Image inpainting
14. Template matching
15. Face and eye detection



VIII Semester

Skill based Course 25 B: Digital Forensics

Credits -3

Learning Objectives:

To equip students with the knowledge and skills necessary to effectively handle digital investigations, ensuring the preservation, analysis, and presentation of digital evidence in a legallysound manner.

Learning Outcomes: Upon successful completion of the course, students will be able to:

1. Gain a clear understanding of the fundamentals of digital forensics
2. Develop knowledge and skills in analyzing storage media and file systems
3. Learn about network forensics and acquire practical skills in network packet sniffing, analysis using tools like Wireshark and TCPDUMP
4. Gain expertise in logs and event analysis, data carving
5. Develop proficiency in wireless and web attacks.

UNIT-I

Introduction to Digital Forensic: Definition of Computer Forensics, Cyber Crime, Evolution of Computer Forensics, Objectives of Computer Forensics, Roles of Forensics Investigator, Forensics Readiness, Steps for Forensics

Computer Forensics Investigation Process: Digital Forensics Investigation Process-Assessment Phase, Acquire the Data, Analyze the Data, Report the Investigation

Digital Evidence and First Responder Procedure: Digital Evidence, Digital Evidence Investigation Process. First Responders Toolkit, Issues Facing Computer Forensics, Types of Investigation, Techniques in digital forensics

UNIT-II

Understanding Storage Media and File System: The Booting Process, LINUX Boot Process, Mac OS Boot Sequence, Windows 10 Booting Sequence, File System, Type of File Systems.

Windows Forensics: Introduction to Windows Forensics, Windows Forensics Volatile Information, Windows Forensics Non- Volatile Information, Recovering deleted files and partitions, Windows Forensics Summary.

Usage of Slack space, tools for Disk Imaging, Data Recovery, Vulnerability Assessment

Tools, Encase and FTK tools: **FTK Imager:**

Digital Forensics Road map: Static Data Acquisition from windows using FTK Imager, Live Data Acquisition using FTK Imager

Installation of KALI Linux, RAM Dump Analysis using Volatility, Static Data Acquisition from Linux OS

UNIT-III

Recovering Deleted Files and Partitions: Digital Forensics Tools, Overview of EnCase Forensics, Deep Information Gathering Tool: Dmitry Page, Computer Forensics Live Practical byusing Autopsy and FTK Imager

Network Forensics: Introduction to Network Forensics, Network Components and their forensic importance, OSI internet Layers and their Forensic importance, Tools Introduction Wireshark and TCPDUMP, Packet Sniffing and Analysis using Ettercap and Wireshark, Wireshark Packet Analyzer, Packet Capture using TCP DUMP

Website Penetration: WHOIS, nslookup

UNIT-IV

Logs & Event Analysis: Forensic Analysis using AUTOPSY: Linux and Windows, Forensics andLog analysis, Compare and AUDIT Evidences using Hashdeep Page

Data Carving using Bulk Extractor: Kali Linux and Windows, Recovering Evidence from Forensic Images using Foremost

Application Password Cracking: Introduction to Password Cracking, Password Cracking usingJohn the Ripper, Password Cracking using Rainbow Tables, PDF File Analysis, Remote Imagingusing E3 Digital Forensics

UNIT-V

Wireless and Web Attacks: WiFi Packet Capture and Password Cracking using Aircrack ng, Introduction to Web Attacks, Website Copier: HTTRACK, SQL Injection, Site Report Generation: Netcraft, Vulnerability Analysis: Nikto, Wayback Machine, Image Metadata Extraction using Imago

Email Forensics Investigation: Email Forensics Investigations, **Mobile Device Forensics:** Mobile Forensics

Preparation for Digital Forensic investigation: Investigative reports, expert witness and cyber regulations, Introduction to Report Writing, Forensic Reports & Expert Witness

Text Book(s)

1. **Digital Forensics**, *Dr.Jeetendra Pande, Dr. Ajay Prasad,* Uttarakhand Open University, Haldwan 2016
2. *Nilakshi Jain, Dhananjay Kalbande*, **"Digital Forensic: The fascinating world of Digital Evidences"** Wiley India Pvt Ltd 2017.
3. *Cory Altheide, Harlan Carvey* **"Digital forensics with open source tools**" Syngress Publishing, Inc. 2011.
4. *Chris McNab*, **Network Security Assessment**, By O'Reilly.

Reference Books

1. *Jason Luttgens, Matthew Pepe, Kevin Mandia*, **"Incident Response and computer forensics",**3rd Edition Tata McGraw Hill, 2014.
2. *Clint P Garrison,* **"Digital Forensics for Network, Internet, and Cloud Computing A forensic evidence guide for moving targets and data"** , Syngress Publishing, Inc. 2010

SUGGESTED CO-CURRICULAR ACTIVITIES:

1. Training of students by related industrial experts.
2. Assignments
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Case Studies: Vulnerability Assessment of Your College Website

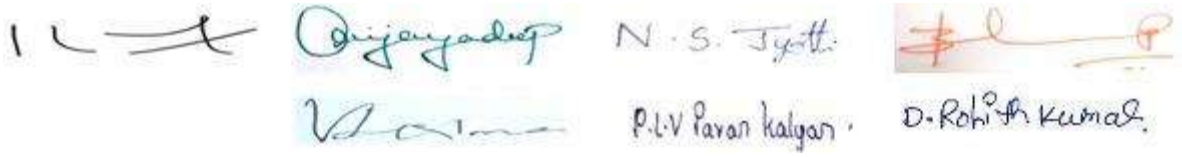
VIII Semester

Skill based Course 25 B: Digital Forensics

Credits -1

List of Experiments:

1. Study of Computer Forensics and different tools used for forensic investigation
2. How to Recover Deleted Files using Forensics Tools
3. Study the steps for hiding and extract any text file behind an image file/ Audio file (Steganography)
4. How to Extract Exchangeable image file format (EXIF) Data from Image Files using Exifreader Software
5. Data Acquisition using FTK imager
6. How to make the forensic image of the hard drive using EnCase Forensics/Autopsy
7. How to Restoring the Evidence Image using EnCase Forensics/Autopsy
8. How to Collect Email Evidence in Victim PC
9. How to Extracting Browser Artifacts
10. How to View Last Activity of Your PC
11. Find Last Connected USB on your system (USB Forensics)
12. Comparison of two Files for forensics investigation by Compare IT software
13. Live Forensics Case Investigation using Autopsy



WEB INTERFACE DESIGN TECHNOLOGIES

B.Sc Examinations Model Paper

Semester : V

Time : 3hrs **Max. Marks:70**

Section –A (20 Marks)

Answer any *Five* questions. All questions carry equal marks. 5 X 4 = 20M

1. What is the difference between web applications and desktop applications?
2. Name any three HTML tags used for adding images or multimedia components.
3. What is the syntax of a CSS rule?
4. Differentiate between padding and margin in CSS.
5. What is DHTML?
6. What are regular expressions used for in JavaScript?
7. How can you access HTML form elements using JavaScript?
8. What is the Document Object Model (DOM) in JavaScript?

Section –B (50 Marks)

Answer all Questions. All questions carry equal marks. 5 X 10 = 50M

9. A) Explain the basic structure of an HTML document with an example.

OR

B) Discuss the various types of lists in HTML and explain their differences with examples.

10. A) Explain the different types of CSS selectors and combinators with suitable examples.

OR

B) Discuss the use of pseudo-classes and pseudo-elements in CSS and their significance in styling web pages.

11. A) Explain the different types of JavaScript operators and provide examples for each type.

OR

B) Describe how exception handling works in JavaScript with examples.

12. A) Discuss how to perform data validation using JavaScript in client-side scripting.

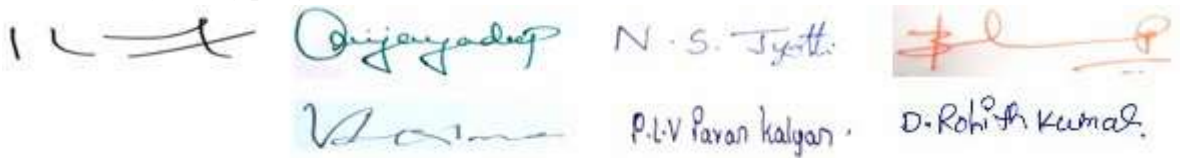
OR

B) Explain how JavaScript can be used to create basic animations using keyboard and mouse events.

13. A) Explain the process of integrating multimedia elements (audio/video) in a web page using JavaScript.

OR

B) Discuss the features and advantages of WordPress, and explain how you can extend its functionality using plugins.



WEB INTERFACE DESIGN TECHNOLOGIES

B.Sc Examinations Model Paper

Semester : V

Time : 3hrs **Max. Marks:70**

Section –A (20 Marks)

Answer any *Five* questions. All questions carry equal marks. 5 X 4 = 20M

1. What is a constant in PHP and how is it defined?
2. Explain the difference between while and for loops in PHP.
3. How do you create an associative array in PHP?
4. Mention any two string manipulation functions in PHP.
5. What is the purpose of using hidden fields in a form?
6. How can you redirect a user in PHP?
7. What is a session in PHP and how is it started?
8. What is the difference between mysql_connect() and mysqli_connect() functions?

Section –B (50 Marks)

Answer all Questions. All questions carry equal marks. 5 X 10 = 50M

9. A) Discuss the different types of data types in PHP with examples.

   OR

   B) Explain the concept of variable scope in PHP and how the static keyword helps preserve state between function calls.
10. A) Explain how to create objects and access object instances in PHP.

    OR

    B) Discuss how PHP handles date and time functions with examples.
11. A) Describe the steps involved in handling file uploads using PHP.

    OR

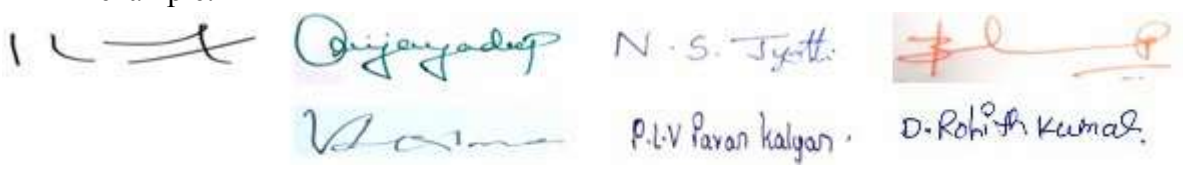
    B) Discuss the role of exception handling in PHP with examples.
12. A) Explain how cookies are set and accessed in PHP with examples.

    OR

    B) Discuss how sessions are managed in an environment with registered users.
13. A) Describe the steps involved in creating a record addition mechanism in PHP and MySQL.

    OR

    B) Explain how to plan and create database tables using PHP and MySQL with an example.



INTERNET OF THINGS

B.Sc Examinations Model Paper

Semester : V

Time : 3hrs **Max. Marks:70**

Section –A (20 Marks)

Answer any *Five* questions. All questions carry equal marks. 5 X 4 = 20M

1. Define IoT and mention any two of its characteristics.
2. What is the difference between IoT and M2M?
3. List any two types of sensors and their applications.
4. What is the role of RFID in IoT?
5. What is Zigbee and how is it used in IoT?
6. Name any two IP-based protocols used in IoT and state their purpose.
7. What is the purpose of the Arduino IDE?
8. Name any two cloud-based platforms used in IoT development.

Section –B (50 Marks)

Answer all Questions. All questions carry equal marks. 5 X 10 = 50M

9. A) Describe the physical and logical design of IoT with examples.

   OR

   B) Explain various real-world applications of IoT and discuss the ethical and legal challenges associated with IoT design.
10. A) Explain the architecture and components of a Wireless Sensor Network and its relation to IoT.

    OR

    B) Compare Arduino and Raspberry Pi development boards for IoT applications.
11. A) Discuss WPAN technologies used for IoT with examples.

    OR

    B) Explain various IP-based communication protocols for IoT and the concept of edge connectivity.
12. A) Explain the basic architecture of Arduino Uno and how to interface it with an LCD.

    OR

    B) Describe how analog and digital sensors are interfaced with Arduino. Provide examples with temperature and motion sensors.
13. A) Discuss the implementation of IoT using Arduino and how to connect it with cloud platforms like Blynk or Thingspeak.

    OR

    B) Explain the security and privacy issues associated with IoT systems and suggest ways to mitigate them.

N. S. Jyothi P.L.V Pavan kalyan D. Rohith Kumar

FOUNDATIONS OF DATA SCIENCE

B.Sc Examinations Model Paper

Semester : V

Time : 3hrs **Max. Marks:70**

Section –A (20 Marks)

Answer any *Five* questions. All questions carry equal marks. 5 X 4 = 20M

1. What are the key skills required to become a Data Scientist?
2. Define data discretization and give one example.
3. What does skewness indicate in descriptive statistics?
4. Name any two types of NoSQL databases.
5. What is a NumPy ndarray?
6. List any two universal functions in NumPy.
7. What is a DataFrame in pandas?
8. What is the purpose of a scatter plot?

Section –B (50 Marks)

Answer all Questions. All questions carry equal marks. 5 X 10 = 50M

9. A) Explain the Data Science process and its relationship with Business Intelligence.

   OR

   B) Describe various data collection strategies and pre-processing techniques such as cleaning, integration, and transformation.
10. A) Discuss ANOVA and its use in statistical analysis.

    OR

    B) Explain different types of NoSQL databases with their structure and applications.
11. A) Describe the various methods of creating NumPy arrays and performing arithmetic operations on them.

    OR

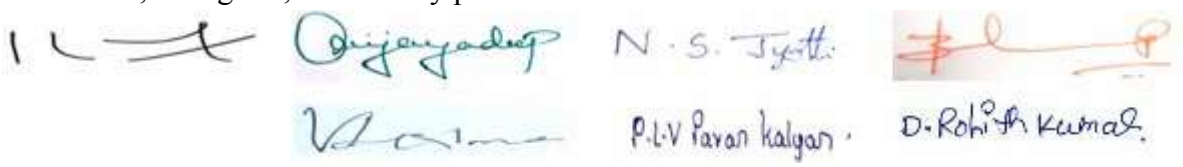
    B) Explain Boolean indexing and transposing arrays with examples in NumPy.
12. A) Describe the essential functionalities of pandas DataFrames such as dropping entries, sorting, and ranking.

    OR

    B) Explain how pandas handles summarizing and computing descriptive statistics along with reading/writing data in text format.
13. A) Discuss different data transformation techniques such as removing duplicates and replacing values using pandas.

    OR

    B) Explain the use of pandas for data visualization with various types of plots like line, bar, histogram, and density plots.



IoT APPLICATIONS DEVELOPMENT AND PROGRAMMING
B.Sc Examinations Model Paper

Semester : V

Time : 3hrs **Max. Marks:70**

Section –A (20 Marks)

Answer any *Five* questions. All questions carry equal marks. 5 X 4 = 20M

1. What is sensor fusion in the context of IoT?
2. List any two types of connectivity used in IoT devices.
3. Mention any two temperature sensors used in IoT applications.
4. What is the function of a gas detector like MQ7 in IoT systems?
5. What is the use of GPIO pins in Raspberry Pi?
6. Mention one difference between Arduino and Raspberry Pi.
7. What is the purpose of the Node-RED Flow Editor?
8. What is LPWAN and where is it used in IoT?

Section –B (50 Marks)

Answer all Questions. All questions carry equal marks. 5 X 10 = 50M

9. A) Explain the classification of sensors based on energy, signal output, and mode of operation.

   OR

   B) Discuss the role of IoT in smart city applications with examples such as smart homes and transportation.
10. A) Describe the working and applications of imaging sensors and proximity sensors in IoT.

    OR

    B) Explain various types of chemical and environmental sensors along with communication protocols used to interface them.
11. A) Describe the setup and basic functionalities of the Raspberry Pi B+ board and explain interfacing of a DHT sensor.

    OR

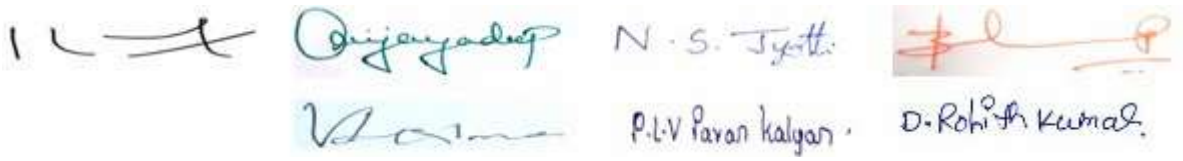
    B) Explain how Python is used in Raspberry Pi for file handling and spreadsheet communication in IoT applications.
12. A) Explain the architecture of Node-RED and its application in IoT systems.

    OR

    B) Discuss different types of visual representations using Matplotlib and their significance in analyzing IoT data.
13. A) Describe the use of Bluetooth, GSM modem, and Firebase in enabling wireless IoT connectivity using Arduino.

    OR

    B) Explain the concept of cluster computing using Raspberry Pi and illustrate the working of a simple MPI program.



APPLICATION DEVELOPMENT USING PYTHON
B.Sc Examinations Model Paper

Semester : V

Time : 3hrs **Max. Marks:70**

Section –A (20 Marks)

Answer any *Five* questions. All questions carry equal marks. 5 X 4 = 20M

1. What are generators in Python?
2. List any two differences between lists and tuples.
3. What does the open() function do in Python?
4. How do you raise a user-defined exception in Python?
5. What is the purpose of the re module in Python?
6. What is the Global Interpreter Lock (GIL) in Python?
7. What is Tkinter in Python?
8. What is DBAPI in Python?

Section –B (50 Marks)

Answer all Questions. All questions carry equal marks. 5 X 10 = 50M

9. A) Explain Python's standard data types and give examples of each.

   OR

   B) Describe list comprehensions, iterators, and sorting techniques in Python with examples.
10. A) Explain exception handling in Python, including try-except blocks and the use of the finally clause.

    OR

    B) Discuss the structure and working of Python modules and packages. Include the process of importing modules and using namespaces.
11. A) Describe the syntax and use of regular expressions in Python with examples of common patterns.

    OR

    B) Explain how Python supports multithreaded programming. Compare the thread and threading modules with examples.
12. A) Describe the components of a GUI application using Tkinter and provide a basic example.

    OR

    B) Discuss how Python can be used for web programming, including CGI scripting and building simple HTTP clients and servers.
13. A) Explain how Python interacts with databases using DBAPI. Provide examples of connecting and querying a database.

    OR

    B) Discuss the concept of Object Relational Mapping (ORM) in Python and its advantages over direct SQL queries.