ADVANCED DATABASE MANAGEMENT SYSTEM

[As per, NEP, Outcome Based Education(OBE) and Choice Based Credit System (CBCS)]
(Effective from the academic year 2023-2024)
SEMESTER – I

Course Code	23SCS11	**CIE Marks**	50
Number of Lecture Hours/Week	03	**SEE Marks**	50
Total Number of Lecture Hours	48	**Exam Hours**	03

CREDITS – 04

Course objectives: This course will enable students

- To understand the significance of relational constrains and object oriented features to DBMS.
- To gain knowledge about NOSQL Databases and Big Data Storage Systems
- To comprehend the query processing efficient information management for Distributed and Parallel DBMS.
- To utilize the advanced topics of data warehousing and mining.
- To enhance the knowledge about Enhanced Data Models and Information Retrieval.

Module I	**Teaching Hours and RBT Levels**
Review of Relational Data Model and Relational Database Constraints: Relational model concepts; Relational model constraints and relational database schemas; Update operations, anomalies, dealing with constraint violations, Types and violations. **Object and Object-Relational Databases:** Overview of Object Database Concepts, Object Database Extensions to SQL, The ODMG Object Model and the Object Definition Language ODL, Object Database Conceptual Design, The Object Query Language OQL, Overview of the C++ Language Binding in the ODMG Standard. **Text Book1: Chapter 5,Chapter 12.1,12.2,12.3,12.4,12.5**	9 Hours L1,L2,L3
Module II	
Disk Storage, Basic File Structures, Hashing, And Modern Storage Architectures: Introduction, Secondary Storage Devices, Buffering of Blocks, Placing File Records on Disk Operations on Files, Files of Unordered Records (Heap Files), Files of Ordered Records (Sorted Files), Hashing Techniques. **NOSQL Databases and Big Data Storage Systems:** Introduction to NOSQL Systems, The CAP Theorem, Document-Based NOSQL Systems and MongoDB, NOSQL Key-Value Stores, Column-Based or Wide Column NOSQL Systems, NOSQL Graph Databases and Neo4j. **Text Book1: Chapter 16.1,16.2, 16.3,16.4,16.5,16.6.** **Chapter 24.1,24.2,24,3,24.4,24.5**	09 Hours L1,L2,L3
Module III	
Parallel and Distributed Databases: Architectures for parallel databases; Parallel query evaluation; Parallelizing individual operations; Parallel query optimizations; Introduction to distributed databases; Distributed DBMS architectures; Storing data in a Distributed DBMS; Distributed catalog	10 Hours L1,L2,L3

management; Distributed Query processing; Updating distributed data; Distributed transactions; Distributed Concurrency control and Recovery. **Text Book2: Chapter 22.**	
Module IV	
Data Warehousing, Decision Support and Data Mining: Introduction to decision support; OLAP, multidimensional model; Window queries in SQL; Finding answers quickly; Implementation techniques for OLAP; Data Warehousing; Views and Decision support, View materialization, Maintaining materialized views. Introduction to Data Mining; Counting co-occurrences; Mining for rules; Tree-structured rules; ROC and CMC Curves; Clustering; Similarity search over sequences; Incremental mining and data streams; Additional data mining tasks. **Text Book2: Chapter 25, Chapter 26.**	10 Hours L1,L2,L3
Module V	
Enhanced Data Models: Active Database Concepts and Triggers, Temporal Database Concepts, Spatial Database Concepts, Multimedia Database Concepts, Introduction to Deductive Databases. **Introduction to Information Retrieval and Web Search:** Information Retrieval (IR) Concepts, Retrieval Models, Types of Queries in IR Systems, Text pre-processing, Inverted Indexing, Evaluation Measures of Search relevance, web Search and Analysis. Trends in Information Retrieval. **Text Book1: Chapter 26.1,26.2, 26.3,26.4,26.5.** **Chapter 27.1,27.2,27.3,27.4,27.5,27.6,27.7,27.8.**	10 Hours L1,L2,L3
Course Outcomes	
The students should be able to: **CO 1:** Design databases using data models and understand the significance of relational Model constraints. **CO 2:** Able to construct and execute optimized queries **CO 3:** Select the appropriate high performance database like parallel and distributed database. **CO 4:** Interpret rule set in the database to implement data warehousing of mining **CO 5:** Discover and design database for Enhanced Data Models for better interoperability.	
Question paper pattern: • The question paper will have ten questions. • There will be 2 questions from each module. • Each question will have questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module.	
Text Books: 1. Elmasri and Navathe: Fundamentals of Database Systems, 7th Edition, Pearson Education, 2013. 2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2013.	
Reference Books: 1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan: Database System Concepts, 6th Edition, McGraw Hill, 2010.	

Internet of things & Applications

[As per, NEP, Outcome Based Education(OBE) and Choice Based Credit System (CBCS)]

(Effective from the academic year 2023 -2024)

SEMESTER – I

Course Code	**23SCS12**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**50**
Total Number of Lecture Hours	**48**	**Exam Hours**	**03**

CREDITS – 4

Course objectives:

This course will enable students to:

- Gain knowledge on combination of functionalities and services of networking
- Understand the definition and significance of the Internet of Things and its applications.
- Discuss the architecture, operation and business benefits of an IoT solution

Module I	**Teaching Hours**	**RBT LEVELS**
What is The Internet of Things? Overview and Motivations, Examples of Applications, IPV6 Role, Areas of Development and Standardization, Scope of the Present Investigation.Internet of Things Definitions and frameworks-IoT Definitions, IoT Frameworks, Basic Nodal Capabilities. Internet of Things Application Examples-Overview, Smart Metering/Advanced Metering Infrastructure-Health/Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Card	**10 Hours**	**L1,L2,L3**
Module II		
Fundamental IoT Mechanism and Key Technologies-Identification of IoT Object and Services, Structural Aspects of the IoT, Key IoT Technologies. Evolving IoT Standards-Overview and Approaches, IETF IPV6 Routing Protocol for RPL Roll, Constrained Application Protocol, Representational State Transfer, ETSI M2M,Third Generation Partnership Project Service Requirements for Machine-Type Communications, CENELEC, IETF Ipv6 Over Low power WPAN, Zigbee IP(ZIP),IPSO	**10 Hours**	**L1,L2,L3**
Module III		
Layer ½ Connectivity: Wireless Technologies for the IoT-WPAN Technologies for IoT/M2M, Cellular and Mobile Network Technologies for IoT/M2M,Layer 3 Connectivity:Ipv6 Technologies for the IoT: Overview and Motivations. Address Capabilities,Ipv6 Protocol Overview, Ipv6 Tunnelling, Ipsec in Ipv6,Header Compression Schemes, Quality of Service in Ipv6, Migration Strategies to Ipv6.	**10 Hours**	**L1,L2,L3**

Module IV		
IoT Systems – logical design using Python: Introduction, functions, modules, Packages, file handling, classes, python packages of interest for IoT. IoT Physical devices & Endpoints: Basic building blocks of an IoT device, About the Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python, Case studies lllustrating IoT design: Home automation, Cities	**10 Hours**	**L2,L3,L4,L5**
Module V		
Data Analytics for IoT – Introduction, Apache Hadoop, Using HadoopMapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis, Structural Health Monitoring Case Study.	**8 Hours**	**L1,L2,L3**

Course outcomes

The students should be able to:

CO1:Develop schemes for the applications of IOT in real time scenarios
CO2:Understand and apply the evolution of IoT Technologies
CO3:Manage the Internet resources through different protocols used in each layer
CO4:Understand and apply the practical knowledge through programming
CO5:Analyze datasets received through IoT devices and its tools

Question paper pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Building the Internet of Things with Ipv6 and MIPv6:The Evolving World of M2M Communications: Daniel Minoli Wiley 2013.
2. Internet of Things: A Hands-on Approach Arshdeep Bahga, Vijay Madisetti Universities Press 2015.

Reference Books:

1. The Internet of Things Michael Miller Pearson 2015 First Edition 2 Designing Connected Products Claire Rowland, Elizabeth Goodman et.al O'Reilly First Edition, 2015

E-books and Online course materials

Online Courses and Video Lectures

- Internet of Things(IoT) Applications https://youtu.be/OfGxbxUCa2k
- Introduction to IoT https://youtu.be/WUYAjxnwjU4
- https://www.tutorialspoint.com/internet_of_things/index.htm#:~:text=IoT%20(Internet%20of%20Things)%20is,to%20any%20industry%20or%20system.
- https://www.javatpoint.com/iot-internet-of-things
- https://www.digimat.in/nptel/courses/video/106105166/L01.html (Video Lectures)

INTELLIGENT SYSTEM
[As per, NEP, Outcome Based Education(OBE) and Choice Based Credit System (CBCS)]
(Effective from the academic year 2023-2024)
SEMESTER – I

Course Code	23SCS132	**CIE Marks**	50
Number of Lecture Hours/Week	03	**SEE Marks**	50
Total Number of Lecture Hours	40	**Exam Hours**	03

CREDITS – 03

Course Learning objectives: This course will enable students

1. To offer a foundation of intelligent system techniques
2. To understand their application in various real-world domains
3. To implement a system with "intelligent" functionality

Module I	**Teaching Hours and RBT Levels**
Introduction: Foundation of Artificial Intelligence, History of AI, Intelligent Agents: Agents and environment, Rationality, the nature of environment, the structure of agents. Problem-solving: Problem solving agents, Example problems	8 Hours L1,L2,L3
Module II	
Searching for Solutions, Uninformed Search strategies: BFS, DFS & Bidirectional, informed search strategies: Branch & bound, Hill Climbing, A*. Game Playing: Introduction, Problem reduction, Bounded look-ahead strategy, Alpha-Beta pruning.	8 Hours L1,L2,L3
Module III	
Knowledge Representation and Reasoning : Knowledge based agents,The wumpus world, Propositional logic, Propositional theorem proving, Effective propositional model checking, Agents based on propositional logic. First Order Logic: Representation Revisited, Syntax and Semantics of First Order logic, Using First Order logic.	08 Hours L1,L2,L3
Module IV	
Inference in First Order Logic: Propositional Versus First Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution Learning : forms of learning ,supervised learning,learning decision trees,	8 Hours L1,L2,L3
Module V	
Expert system:introduction phases,Expert system archtitecture,Expert system vs traditional system,rule based expert system,blackboard systems,truth maintenance systems,Applications of expert systems.list of shell and tools.	8 Hours L1,L2,L3

Course Outcomes
CO1 An ability to independently design and develop intelligent software to provide required services.

CO2 Ability to prepare a technical document and oralpresentation to provide critical analysis of the solution developed

CO3 Apply various Knowledge Representation AI search strategies to solve problems

CO4 Analyse Learning algorithm and Knowledge representation for the given specifications and data

CO5 Understand the Knowledge about the Expert Systems and apply

Question paper pattern:

The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Artificial Intelligence: A Modern Approach by Stuart Russell, Peter Norvig, 3rd Edition, Pearson Education, 2017.
2. Principles of Soft computing, S N Sivanandam, Deepa S. N, Wiley, India, ISBN: 9788126527410.

Reference Books:

1. Artificial Intelligence by George F Luger, 5th Edition Pearson Education, 2009.
2. Saroj Kaushik,artifitial intelligence,Cengane learning,2014

Wireless Networks & Mobile Computing **[As per, NEP, Outcome Based Education(OBE) and Choice Based Credit System (CBCS)]** **(Effective from the academic year 2023-2024)** **SEMESTER – I**			
Course Code	23SCS141	**CIE Marks**	50
Number of Lecture Hours/Week	03	**SEE Marks**	50
Total Number of Lecture Hours	48	**Exam Hours**	03
CREDITS – 03			

Course Learning objectives: This course will enable students

1. Define concepts of wireless communication.
2. Compare and contrast propagation methods, Channel models, capacity calculations multiple
3. Antennas and multiple user techniques used in the mobile communication.
4. Explain CDMA, GSM. Mobile IP, WImax and Different Mobile OS
5. Illustrate various Markup Languages CDC, CLDC, MIDP; Programming for CLDC, MIDlet
6. model and security concerns

Module I	**Teaching Hours and RBT Levels**
Mobile Computing Architecture: Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing. Wireless Networks : Global Systems for Mobile Communication (GSM and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, SM MT, SM MO, SMS as Information bearer, applications, GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS, Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Introduction to WiMAX.	10 Hours L1,L2,L3
Module II	
Mobile Client: Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices. Mobile IP: Introduction, discovery, Registration, Tunnelling, Cellular IP, Mobile IP with IPv6.	10 Hours L1,L2,L3
Module III	
Mobile OS and Computing Environment: Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux, Proprietary OS Client Development: The development process, Need	09 Hours L1,L2,L3

analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators	
Module IV	
Building, Mobile Internet Applications: Thin Client: Architecture the client, Middleware ,Messaging servers, Processing a wireless request, Wireless Applications Protocol(WAP) Overview, Wireless Languages: Markup languages, HDML,WML,HTML, CHTML,XHTML, VoiceXML.	10 Hours L1,L2,L3
Module V	
J2ME: Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life-cycle, Creating new application, MIDlet event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP.	9 Hours L1,L2,L3
Course Outcomes	
Course Outcome **At the end of the course the student will be able to:** CO 1: Explain state of art techniques in wireless communication. CO 2: Discover CDMA, GSM. Mobile IP, WImax. CO 3: Understand Develop and Deploy Mobile Operating systems CO 4: Developing wireless internet applications via HDML,WML etc. CO 5:Demonstrate program for CLDC, MIDP let model and security concerns.	
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.	
Text Books: 1. Ashok Talukder, RoopaYavagal, Hasan Ahmed: Mobile Computing, Technology, Applications and Service Creation, 2nd Edition, Tata McGraw Hill, 2010. 2. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley India, 2003	
Reference Books: 1.Raj kamal: Mobile Computing, Oxford University Press, 2007. 2.ItiSahaMisra: Wireless Communications and Networks, 3G and Beyond, Tata McGraw Hill, 2009.	

RESEARCH METHODOLOGY AND ETHICS

[As per, NEP, Outcome Based Education(OBE) and Choice Based Credit System (CBCS)]

(Effective from the academic year 2023-2024)

SEMESTER-I

Course Code	23RM15	CIE Marks	50
Number of Lecture Hour/Week	03	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS-03			

Course Objectives: This course will enable students to:

1. To give an overview of the research methodology and explain the technique of defining a research problem.
2. To explain the functions of the literature review in research.
3. To explain carrying out a literature search, its reviewand writing a review.
4. To explain various research designs and different methods of data collections.
5. To explain an overview of ethics in research.

Modules	Teaching Hours
Module -1	
Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India.	**08 Hours**
Module -2	
Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem. **Reviewing the literature:** Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature.	**08 Hours**
Module -3	
Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design. **Data Collection**: Collection of Primary Data,Collection of SecondaryData, Selection of Appropriate Method for Data Collection.	**08 Hours**
Module -4	
Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation,Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Precautions for Writing Research Reports. **Philosophy And Ethics**: Introduction to Philosophy: definition, nature and Scope, Concept, Branches. Ethics: definition, moral philosophy, nature of moral judgements and reaction	**08 Hours**

Module-5	
Scientific Conduct: Ethics with respect to science and research, Intellectual honesty and research integrity, Scientific misconducts: Falsification, Fabrication, and Plagiarism(FFP), Redundant publications: duplicate and overlapping publications, salami slicing, Selective reporting and misrepresentation of data.	**08 Hours**

Course Outcomes: After studying this course, students will be able to:

CO-1-Discuss research methodology and the technique of defining a research problem

CO-2-Understand the functions of the literature review in research, carrying out a literature search.

CO-3-Explain various research designs and data collection in research.

CO-4- Explain the art of interpretation and the art of writing research reports.

CO-5-Understand the concept and significance of ethics in research.

Text Books:

1. Research Methodology: Methods and Techniques C.R. Kothari, Gaurav Garg New Age International 4th Edition, 2018.
2. Research Methodology step-by- Research Methodology step-by- Ranjit Kumar, SAGE PublicationsLtd, 3rd Edition, 2011.
3. Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN:978-81-939482-1-7.

Advanced Database Management Lab

[As per, NEP, Outcome Based Education(OBE) and Choice Based Credit System (CBCS)]

(Effective from the academic year 2023-2024)

SEMESTER – I

Course Code	23SCSL16	**CIE Marks**	50
Number of Lecture Hours/Week	02	**SEE Marks**	50
Total Number of Lecture Hours	03	**Exam Hours**	03

CREDITS – 01

Course Learning Objectives: This course will enable students to:

- Implement different working concepts of ADBMS using object oriented database and SQL Queries.
- Strong practice in SQL programming through a variety of database problems.
- Develop database applications using front-end tools and back-end DBMS.
- To acquire practical knowledge on advanced databases and its applications.

PART-A

1. Consider the schema for College Database:

STUDENT(USN, SName, Address, Phone, Gender)
SEMSEC(SSID, Sem, Sec) CLASS(USN, SSID)
COURSE(Subcode, Title, Sem, Credits)
IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)

Write SQL queries to

1. List all the student details studying in fourth semester 'C' section.
2. Compute the total number of male and female students in each semester and in each section.
3. Create a view of Test1 marks of student USN '1BI15CS101' in all Courses.
4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.
5. Categorize students based on the following criterion: If FinalIA = 17 to 20 then CAT = 'Outstanding' If FinalIA = 12 to 16 then CAT = 'Average' If FinalIA< 12 then CAT = 'Weak' Give these details only for 8th semester A, B, and C section students.

2. Consider the schema for Company Database:

EMPLOYEE(SSN, Name, Address, Sex, Salary, SuperSSN, DNo)
DEPARTMENT(DNo, DName, MgrSSN, MgrStartDate)
DLOCATION(DNo,DLoc) PROJECT(PNo, PName, PLocation, DNo)
WORKS_ON(SSN, PNo, Hours)

Write SQL queries to

1. Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project.
2. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise.
3. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department.
4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator).
5. For each department that has more than five employees, retrieve the department

number and the number of its employees who are making more than Rs. 6,00,000.

3. Study & Implementation of different types of constraints.

Part B

1. **Implementation of Data partitioning through Range and List partition.**
2. Study & Implementation of Database Backup & Recovery commands, Rollback, Commit and Savepoint.
3. Study & Implementation of PL/SQL.
4. Study & Implementation of SQL Triggers.

Course Outcomes:

The student will be able to :

CO1:Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS.

CO2:Use Structured Query Language (SQL) for database manipulation.

CO3:Do query evaluation and query optimization.

CO4:To analyze and work on areas like Storage, Retrieval, Multi valued attributes, Triggers and other complex objects, algorithms etc. related to ADBMS.

Conduct of Practical Examination:

- Experiment distribution
  - For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.
  - For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.
- Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- Marks Distribution
- For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+30+5 = 50 Marks
- For laboratories having PART A and PART B
  - i. Part A – Procedure + Execution + Viva = 6 + 12 + 2 = 20 Marks
  - ii. Part B – Procedure + Execution + Viva = 7 + 20 + 3= 30 Marks

Internet of things LAB
[As per, NEP, Outcome Based Education(OBE) and Choice Based Credit System (CBCS)]
(Effective from the academic year 2023 -2024)
SEMESTER – I

Course Code	23SCSL17	**CIE Marks**	50
Number of Lecture Hours/Week	02	**SEE Marks**	50
Total Number of Lecture Hours	03	**Exam Hours**	03

CREDITS-1

Course Objectives:

1. Describe IoT is and how it works today
2. Design and develop IoT applications

1. Getting started with raspberry Pi and ESP32, connecting to PC monitor & initial setup.

a) To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to 'turn ON' LED for 1 sec after every 2 seconds.

b) To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to 'turn ON' LED when push button is pressed or at sensor detection.

2. a) To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.

   b) To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.

3. To interface Light sensor to Arduino/Raspberry Pi and write a program to print Light sensor readings.
4. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud.
5. Write a program on Arduino/Raspberry Pi to Weather display system using DHT11 and LCD
6. To interface Smart gas leakage email alert using things Speak.
7. Object distance display using 7-segment display and Ultrasonic sensor & read the sensor data when specified key is pressed.

Course outcome:

CO1:Understood raspberry Pi & ESP32 initial setup
CO2:Designed and developed IOT Applications
CO3:Analyzed data through online using thingspeak cloud

Conduct of Practical Examination: Experiment distribution :For laboratories Students are allowed to pick one experiment from set of experiments from the following set of questions, with equal opportunity.

- Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- Marks Distribution :Procedure + Execution + Viva = 8 + 35 + 7= 50 Marks

PROJECT I

[As per, NEP, Outcome Based Education(OBE) and Choice Based Credit System (CBCS)]

(Effective from the academic year 2023 -2024)

SEMESTER – I

Course Code	23SCS18	**CIE Marks**	50
Number of Lecture Hours/Week	4	**SEE Marks**	50
Total Number of Lecture Hours	-	**Exam Hours**	03

CREDITS – 02

Course objectives: This course will enable students to

- Enable the student to design, develop and analyze an application development.

The student will carry out a mini project relevant to the course. The project must be development of an application (Hardware/Software).

Conduction of Practical Examination:

The student shall prepare the report by including:

1. Define project (Problem Definition)
2. Prepare requirements document
   - Statement of work
   - Functional requirements
   - Software / Hardware requirements
3. Develop use cases
4. Research, analyze and evaluate existing learning materials on the application
5. Develop user interface and implement code
6. Prepare for final demo

Evaluation:

- Internal evaluation shall be carried by the Guide and Head of the department for 50 marks.
- Final examination which includes demonstration of the project and viva voce shall be conducted for 50 Marks
- report + Outputs of the project + presentation = 15+15+20 = 50 marks.

Course outcome:

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

CO1:Present the mini-project and be able to defend it.

CO2:Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task

CO3: Habituated to critical thinking and use problem solving skills.

CO4:Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.

CO5:Work in a team to achieve common goal.

DEEP LEARNING

[As per, NEP, Outcome Based Education(OBE) and Choice Based Credit System (CBCS)]
(Effective from the academic year 2023-2024)
SEMESTER – II

Subject Code	23SCS21	**CIE Marks**	50
Number **of Lecture Hours/Week**	03	**SEE Marks**	50
Total Number of Lecture Hours	48	**Exam Hours**	03

CREDITS – 04

Course objectives: This course will enable students

- Explore the basics of neural network and deep learning concepts
- To study different deep learning optimization techniques
- To learn about the sequence modeling and RNNs
- To study use cases of deep learning models

Module I	**Teaching Hours**
Deep Feed forward Networks: Gradient-Based Learning, Hidden Units, Architecture Design, and Back-Propagation. **Regularization:** Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging, Dropout. **Text Book 1: Chapter 6.2 – 6.5 and 7.1 – 7.11**	9 Hours
Module II	
Optimization for Training Deep Models: How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms. Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates. **Convolution Networks:** The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features. **Text Book 1: Chapter 8 & 9**	09 Hours
Module III	
Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks. Long short-term memory **Text Book 1: Chapter 10.1 – 10.6 and 10.10**	10 Hours
Module IV	
Practical Methodology: Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyper parameters,	10 Hours

Debugging Strategies, Example: Multi-Digit Number Recognition. Applications: Vision, NLP, Speech **Text Book 1: Chapter 11 and 12**	
Module V	
AUTOENCODERS: Under complete auto encoders, regularized autoencoders, denoising autoencoders, representational power,layer,size, and depth of autoencoders, stochastic encoders and decoders, applications of autoencoders **Text Book 1: Chapter 14**	10 Hours
Course Outcomes	
The students should be able to: CO1: Design and train feed forward neural networks for classification and regression tasks. CO2: Adapt optimization algorithms to effectively train neural networks. CO3: Evaluate the sequence modeling techniques for tasks like time series prediction or text generation. CO4:Implement deep learning algorithms and solve real-world problems C05: Gain practical skills in implementing different types of autoencoders and understanding their advantages and limitations	
Question paper pattern: • The question paper will have ten questions. • There will be 2 questions from each module. • Each question will have questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module.	
Text Books: 1."Deep Learning" Lan Good fellow and Yoshua Bengio and Aaron Courville MIT Press 2016.	
Reference Books: 2. Neural Networks:Asystematic Introduction Raúl Rojas 1996. 3. Pattern Recognition and machine Learning Chirstopher Bishop 2007	

Data Science

[As per, NEP, Outcome Based Education(OBE) and Choice Based Credit System (CBCS)]

(Effective from the academic year 2023-2024)

SEMESTER – II

Course Code	**23ADS22**				**CIE Marks**	**50**
Number Lecture Hour/Week	**L**	**T**	**P**	**TOTAL**	**SEE Marks**	**50**
	3	**1**	**0**	**4**		
Number of Lecture Hours	**48**				**Exam Hours**	**03**
Credits-04						

Course Objectives: This course will enable students to

- **Progarrming data science concepts and Big Data modelling using R language.**
- **Analyze Basic tools of EDA, Data science process with case studies and Different algorithms.**
- **Optimize & solve real life problems with different spam filter.**
- **Explore Feature Generation and Feature Selection.**

MODULE -1	**TEACHING HOURS**
Introduction : what is data science ?Big data and data science hype–and getting past the hype, Whynow?–Datafication, Current landscape of perspectives, Skillsets. Needed Statistical Inference: Populations and samples, Statistical modeling, probability distributions, fitting a model, - Introduction to R	**10**
MODULE -2	
Exploratory Data Analysis and the Data Science Process: Basic tools (plots, graphs and summary statistics) of EDA, Philosophyof EDA, The DataScience Process, CaseStudy: Real Direct (online real estate firm). Three Basic Machine Learning Algorithms: Linear Regression, k-Nearest Neighbors (kNN), k-means.	**10**
MODULE -3	
One More Machine Learning Algorithm and Usage in Applications: Motivating application: Filtering Spam, Why Linear Regression and k-NN are poor choices for Filtering Spam, Naïve Bayes and why it works for Filtering Spam, Data Wrangling:APIs and other tools for scrapping the Web.	**8**
MODULE -4	
Feature Generation and Feature Selection (Extracting Meaning from Data): Motivating application: user (customer) retention. Feature Generation (brainstorming, role of domain expertise, and place for imagination), Feature Selection algorithms. Filters; Wrappers; Decision Trees; Random Forests. Recommendation Systems: Building a User-Facing Data Product, Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis, Exercise: build your own recommendation system.	**10**

MODULE -5	
Mining Social-Network Graphs: Social networks as graphs, Clustering of graphs, Direct discovery of communities in graphs, Partitioning of graphs, Neighbourhood properties in graphs, Data Visualization: Basic principles, ideas and tools for data visualization. DataScience and Ethical Issues, Discussions on privacy, security,ethics, Next-generation data scientists.	**10**

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

CO1:Apply data science concepts to real world problems.
CO2:Analyze Basic tools of EDA, Data science process with case studies with different algorithms.
CO3:Apply spam filters and API's to solve real life problems.
CO4:Analyze the Feature Selection algorithms and Recommendation Systems.
CO5:Design Map Reduce Solutions.

TEXT BOOKS:

1. Cathy O'Neil and Rachel Schutt, "Doing Data Science", Straight Talk from The Frontline O'Reilly, 2014.
2. Jure Leskovek, AnandRajaraman and Jeffrey Ullman , "Mining of Massive Datasets. V2.1", Cambridge University Press, 2014.

REFERENCE BOOKS:

1. Kevin P. Murph, "Machine Learning: A Probabilistic Perspective", 2013.
2. Jiawei Han, MichelineKamber and Jian Pei, "Data Mining: Concepts and Techniques", Third Edition ,2012.

QUESTION PAPER PATTERN:

- The question paper will have ten questions.
- Each full question consisting of 20 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- The students will have to answer 5 full questions, selecting one full question from each module.

CLOUD SECURITY

[As per, NEP, Outcome Based Education(OBE) and Choice Based Credit System (CBCS)]

(Effective from the academic year 2023-2024)

SEMESTER – II

Subject Code	23SCS233	**CIE Marks**	50
Number of Lecture Hours/Week	3	**SEE Marks**	50
Total Number of Lecture Hours	40	**Exam Hours**	03

CREDITS – 3

Course objectives:

1. Define core cloud computing concepts and fundamental principles, the Impact of Cloud Computing on Users
2. Explore Infrastructure Security and Application-Level Data Security
3. Explain Identity and Access management.
4. Explore Security Management in the Cloud
5. Illustrate Security Management in the Cloud

Module I	**Teaching Hours**
WHAT IS CLOUD COMPUTING? Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model, Cloud Deployment Models, Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise.	**8 Hours**
Module II	
Infrastructure Security: Infrastructure Security: The Network Level, Infrastructure Security: The Host Level, Infrastructure Security: The Application Level Data Security and Storage: Aspects of Data Security, Data Security Mitigation, Provider Data and Its Security	**8 Hours**
Module III	
Identity and Access Management: Trust Boundaries and IAM, Why IAM?, IAM Challenges, IAM Definitions, IAM Architecture and Practice, Getting Ready for the Cloud, Relevant IAM Standards and Protocols for Cloud Services, IAM Standards, Protocols, and Specifications for Consumers, Comparison of Enterprise and Consumer Authentication Standards and Protocols, IAM Practices in the Cloud, Cloud Authorization Management, Cloud Service Provider IAM Practice	**8 Hours**
Module IV	
Security Management in the Cloud: Security Management Standards, Security Management in the Cloud, Availability Management, SaaS Availability Management, PaaS Availability Management, IaaS Availability Management, Access Control	**8 Hours**

Module V	
Audit and Compliance: Internal Policy Compliance, Governance, Risk, and Compliance (GRC) , Illustrative Control Objectives for Cloud Computing, Incremental CSP-Specific Control Objectives, Additional Key Management Control Objectives, Control Considerations for CSP Users, Regulatory/External Compliance, Other Requirements, Cloud Security Alliance, Auditing the Cloud for Compliance	**8 Hours**

COURSE OUTCOME

CO1:Explore the impact of Cloud Computing on Users
CO2:Analyze the Infrastructure Security and Application Level Data Security
CO3:Investigate Identity Management
CO4:Explore the Security Management in the cloud
CO5:Illustrate Security Management in the Cloud

Text Books:

2. Tim Mather, SubraKumaraswamy , ShahedLatif , Cloud Security and Privacy, An Enterprise Perspective on Risks and Compliance, Oreilly Media, 2009

Reference Books:

3. Vic (J.R.) Winkler, Securing the Cloud, Cloud Computer Security Techniques and Tactics, Syngress, 2011

E-books and Online course materials

1. Cloud Security Full Course https://www.youtube.com/watch?v=Ijkvx1u0w6o
2. https://www.youtube.com/watch?v=PEl3RWFKOFk

Question paper pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

BLOCKCHAIN TECHNOLOGY& ITS APPLICATION

[As per NEP,OBE& Choice Based Credit System (CBCS) scheme]

(Effective from the academic year 2023 -2024)

SEMESTER – II

Subject Code	23SCS231	**CIE Marks**	50
Number of Lecture Hours/Week	03	**SEE Marks**	50
Total Number of Lecture Hours	40	**Exam Hours**	03

CREDITS – 03

Course objectives:

- The blockchain technology course allows the students to explore the driving force behind the cryptocurrency Bitcoin. Along with the Decentralization, Cryptography
- Students gets knowledge about Bitcoins with itsalternative coins, Smart contracts and outside ofcurrencies .
- students will be able to study about applications in various fields.

Module I	**Teaching Hours**
Blockchain 101: Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain, Decentralization: Decentralization using Blockchain, SmartContracts: Definition,Ricardiancontracts.	10 Hours
Module II	
Cryptography and Technical Foundations and Hyperledger: Cryptographic primitives, Asymmetric cryptography, Public and private keys. Hyperledger: Projects, Hyperledger as a protocol, Hyperledger Fabric.	08 Hours
Module III	
BitcoinandAlternativeCoinsA:BitcoinA Digital Cryptocurrency, Bitcoin limitations. Alternative Coins, Theoretical foundations, Namecoin, Litecoin, Primecoin,Zcash.	08 Hours
Module IV	
Alternative Blockchains: Blockchains Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media.	08 Hours
Module V	
Enabling Smart Education System UsingBlockchain Technology,Blockchain Technology in Smart-Cities: Blockchain in Smart Cities,Blockchain: A NewSafeguardto Cybersecurity,Blockchain Technology and FashionIndustry-Blockchain for Fashion Industry.	06 Hours

Course Outcomes: At the end of the course the student will be able to:
CO1: Understand the types, benefits and limitation of block chain and regarding smart contracts .
CO2:Explore the cryptography concepts and Hyperledger protocols along with the architecture.
CO3:Enumerate the Bitcoin features and its alternative options.
CO4: Applications in various fields
CO5: exploring the block chain technology accessibility in various fields .

Question paper pattern:
The question paper will have ten questions. There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Textbook/ Textbooks
1 Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Author- Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1- 78712-544-5, 2017.
2. Blockchain Technology:Applications and Challenges, Author-Sandeep Kumar Panda · Ajay Kumar Jena · Santosh Kumar Swain · Suresh Chandra SatapathyEditors

Reference Books:

1. Bitcoin and Cryptocurrency Technologies, Author- Arvind Narayanan, JosephBonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Princeton University,2016
2. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Author- DanielDrescher, Apress, First Edition,2017
3. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Andreas M. Antonopoulos,O'Reilly Media, First Edition,2014
4. Bahga, Vijay Madisetti, "Block chain Applications: A Hands-On Approach", Arshdeep Bahga, Vijay Madisetti publishers 2017.

HUMAN COMPUTER INTERACTION

[As per, NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2023-2024)
SEMESTER – II

Course Code	**23SCS241**	**CIE Marks**	**50**
Number of Lecture Hours/week	**03**	**SEE Marks**	**50**
Total Number of Lecture Hours	**40**	**Exam Hours**	03

CREDITS 03

CourseObjectives:

1. Toprovidethebasicknowledgeonthelevelsofinteraction,designmodels,techniquesand validations focusing on the different aspects of human-computer interface and interactions
2. Tomakethelearnerstothinkindesignperspectiveandtoevaluateinteractivedesign
3. To use the concepts and principles of HCI to analyze and propose solution for real life applications
4. To become familiar with recent technology trends and challenges in HCI domain

Module:1	**HCI Foundations**	**8hours**

Input–outputchannels,Humanmemory,thinking:reasoningandproblemsolving,Emotion, Individualdifferences,Psychologyandthedesignofinteractivesystems,Textentrydevices, Positioning,pointinganddrawing,Displaydevices,Devicesforvirtualrealityand3Dinteraction, Physical controls, sensors and special devices, Paper: printing and scanning

Module:2	**Designing Interaction**	**8hours**

OverviewofInteractionDesignModels,Discovery-Framework,Collection-Observation, Elicitation, Interpretation - Task Analysis, Storyboarding, Use Cases, Primary Stakeholder Profiles, Project Management Document

Module:3	**Interaction Design Models**	**8 hours**

Model Human Processor - Working Memory, Long-Term Memory, Processor Timing, Keyboard Level Model - Operators, Encoding Methods, Heuristics for M Operator Placement, What the Keyboard Level Model Does Not Model, Application of the Keyboard Level Model, GOMS - CMN-GOMSAnalysis,ModelingStructure,StateTransitionNetworks-Three-StateModel,Glimpse Model, Physical Models, Fitts' Law

Module:4	**Guide Lines in HCI**	**8hours**

Schneiderman'seightgoldenrules,Norman'sSeverprinciples,Norman'smodelofinteraction,Nielsen's ten heuristics, Heuristic evaluation, contextual evaluation, Cognitive walk-through

Module:5	**Collaboration And Communication**	**8hours**

Face-to-faceCommunication,Conversation,Text-basedCommunication,Groupworking,Dialog designnotations,Diagrammaticnotations,Textualdialognotations,Dialogsemantics,Dialoganalysis anddesign.
Groupware, Meeting and decision support systems, Shared applications and artifacts, Frameworks for groupware Implementing synchronous groupware, Mixed, Augmented and Virtual Reality

Text Book(s)
A Dix, Janet Finlay, G D Abowd, R Beale., Human-Computer Interaction, 3rd Edition, Pearson Publishers,2008
Reference Books
Schneiderman, Plaisant, Cohen and Jacobs, Designing the User Interface: Strategies for Effective Human Computer Interaction, 5th Edition, Pearson Publishers, 2010.
Hans-Jorg Bullinger," Human-Computer Interaction", Lawrence Erlbaum Associates, Publishers
Jakob Nielsen," Advances in Human-computer Interaction",Ablex Publishing Corporation
Thomas S. Huang," Real-Time Vision for Human-Computer Interaction", Springer
Preece et al, Human-Computer Interaction, Addison-Wesley, 1994

Course outcomes:

CO1:Enumerate the basic concepts of human, computer interactions
CO2:Create the processes of human computer interaction lifecycle
CO3:Analyze and design the various interaction design models
CO4:Applytheinterfacedesignstandards/guidelinesforevaluatingthedeveloped interactions
CO5:Establish the different levels of communication across the application stakeholders
Apply product usability evaluations and testing methods

Question paper pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module

DEEP LEARNING LAB

[As per, NEP, Outcome Based Education(OBE) and Choice Based Credit System (CBCS)]
(Effective from the academic year 2023-2024)
SEMESTER – II

Subject Code	23SCSL25	**CIE Marks**	50
Number of Lecture Hours/Week	02	**SEE Marks**	50
Total Number of Lecture Hours	03 hours per lab	**Exam Hours**	03

CREDITS – 01

Course Objectives:

This laboratory course enables students to get practical experiement, design,development, Implementation, analysis, and evaluvation/testing of.

- Back propagation algorithms.
- Feed-forward Neural Networks,CNN,RNN
- Generative Adversarial Networks,Autoencoders
- Artificial and Recurrent Neural Networks

Implement all the programs in Java/Python/R Programming Language and LinUX/Windows as os.

Programs list:

I. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

2.Build an Artificial Neural Network by implementing the Forward propagation algorithm And test the same using appropriate data sets.

3. Build Understanding Model Performance and Application in Machine

4. Implementing Advanced Regularization Techniques and Model Enhancements.

5 .Implement the Advanced Techniques in Machine Learning

6Demonstrate CNN algorithm by taking suitable data for a simple application.

7. Demonstrate the Recurrent Neural Networks, algorithm by taking suitable data for any simple
Application.

8. Demonstrate and Explore the auto encoders taking suitable dataset

Course Outcomes :After studying this course, students will be able to:

CO1:Learn The Fundamental Principles Of Deep Learning.

CO2: Learn to optimize CNN Architectures for improved performance & efficiency

CO3: Implement Deep Learning Algorithms And Solve Real-world problems.

CO4:Learn how to implement RNN Using popular deep learning frameworks such as Tensor flow or pytorch

CO5: apply auto encoders can be used for generative modeling .

Semester End Evaluation (SEE): SEE marks for the practical course is 50 Marks. SEE shall be conducted jointly by the two examiners of the same institute; examiners are appointed by the University. All laboratory experiments are to be included for practical examination. Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly. Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners. Change of experiment is allowed only once and 10% Marks allotted to the procedure part to be made zero.

Marks Distribution

For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+30+5 = 50 Marks

Data Science Lab

[As per, NEP, Outcome Based Education(OBE) and Choice Based Credit System (CBCS)]

(Effective from the academic year 2023-2024)

SEMESTER – II

Course Code	**23ADSL26**				**CIE Marks**	**50**
Number Lecture Hour/Week	**L**	**T**	**P**	**TOTAL**	**SEE Marks**	**50**
	0	**0**	**2**	**2**		
Number of Lecture Hours	**30**				**Exam Hours**	**03**

Credits-01

Course Objectives: This course will enable students to

- **Understand the R Programming Language.**
- **Exposure on solving of data science problems.**
- **Understand the Classification and Regression model.**

Demonstrate the following programs using R/Python programming languages.

1. **R AS CALCULATOR APPLICATION: Using with and without R objects on console,Using mathematical functions on console, Write an R script, to create R objects for calculator application and save in a specified location in disk.**
2. **DESCRIPTIVE STATISTICS IN R: Write an R script to find basic descriptive statistics using summary, Write an R script to find subset of dataset by using subset().**
3. **READING AND WRITING DIFFERENT TYPES OF DATASETS: Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location, Reading Excel data sheet in R, Reading XML dataset in R.**
4. **VISUALIZATIONS: Find the data distributions using box and scatter plot, Find the outliers using plot, Plot the histogram, bar chart and pie chart on sample data.**
5. **CORRELATION AND COVARIANCE: Find the correlation matrix, Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.**
6. **REGRESSION MODEL: Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. Require (foreign),require(MASS).**
7. **MULTIPLE REGRESSION MODEL: Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset.**
8. **REGRESSION MODEL FOR PREDICTION: Apply regression Model techniques to predict the data on above dataset.**
9. **CLASSIFICATION MODEL: Install relevant package for classification. Choose classifier for classification problem. Evaluate the performance of classifier.**
10. **CLUSTERING MODEL: Clustering algorithms for unsupervised classification. Plot the cluster data using R visualizations.**

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

CO1: Demonstrate proficiency with statistical analysis of data.

CO2:Illustrate the ability to build and assess data-based models

CO3: Optimize the data using Classifiers.

CO4: Apply clustering algorithms and logistic regressions on data sets.

CO5: Apply kernel techniques on datasets.

Semester End Evaluation (SEE): SEE marks for the practical course is 50 Marks. SEE shall be conducted jointly by the two examiners of the same institute; examiners are appointed by the University. All laboratory experiments are to be included for practical examination. Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly. Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners. Change of experiment is allowed only once and 10% Marks allotted to the procedure part to be made zero.

Marks Distribution For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+30+5 = 50 Marks

PROJECT II

[As per NEP,OBE Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2023 -2024)
SEMESTER – II

Subject Code	23SCS27	**CIE Marks**	50
Number of Lecture Hours/Week	_____	**SEE Marks**	50
Total Number of Lecture Hours	03 hours per lab	**Exam Hours**	03

CREDITS – 02

Course objectives: This course will enable students to

- Enable the student to design, develop and analyze an application development

The student will carry out a mini project relevant to the course. The project must be development of an application (Hardware/Software). It is preferable if the project is based on mobile application development.

Conduction of Practical Examination:

The student shall prepare the report by including:

1Define project (Problem Definition)

2Prepare requirements document

- Statement of work
- Functional requirements
- Software / Hardware requirements

.3. Develop use cases

4 Research, analyze and evaluate existing learning materials on the application

5 Develop user interface and implement code

6 Prepare for final demo

Evaluation:

- Evaluation shall be taken up at the end of the semester.
- Project work evaluation and viva-voce examination shall be conducted.
- Internal evaluation shall be carried by the Guide and Head of the department for 50 marks.
- Final examination which includes demonstration of the project and viva voce shall be conducted for 50 Marks viz report + Outputs of the project + presentation = 15+15+20 = 50 marks.

COURSE OUTCOME:

CO1:Understand the basic concepts & broad principles of Industrial projects
CO2: Understand concepts of Project and Production Management.
CO3:Get capable of self education and clearly understand the value of achieving perfection in project implementation & completion.
CO4:Apply the theoretical concepts to solve industrial problems with teamwork and multidisciplinary approach
CO5:Demonstrate professionalism with ethics; present effective communication skills and relate engineering issues to broader societal context

Data Visualization						
Course Code	**23ADS311**				**CIE Marks**	**50**
Number Lecture Hour/Week	**L**	**T**	**P**	**TOTAL**	**SEE Marks**	**50**
	2	**1**	**0**	**3**		
Number of Lecture Hours	**40**				**Exam Hours**	**03**
Credits-03						

Course Objectives: This course will enable students to
➢ Understand the role and importance of data visualization in communication.
➢ Apply core design principles to create clear and impactful visualizations.
➢ Identify and select appropriate visualization techniques for different data types and goals.
➢ Gain practical experience using popular data visualization tools like Excel, Power BI, Tableau, and Python libraries.
➢ Develop the ability to critique and evaluate existing visualizations.

MODULE NO.	TOPICS	TEACHING HOURS	RBT LEVEL
1	**Introduction to Data Visualization**: **The Power of Data Visualization:** Understanding the role of data visualization in communication, storytelling with data. **Human Perception and Visual Design:** Exploring how humans perceive visual information and applying design principles for effective visualizations. **Data Types and Visualizations:** Matching visualization techniques to different data types (nominal, ordinal, quantitative) and exploring common chart types (bar charts, line charts, pie charts, scatter plots, etc.).	**8**	**L1, L2, L3**
2	**Data Preparation and Exploration:** **Data Cleaning and Transformation:** Preparing data for visualization by identifying and addressing missing values, outliers, and inconsistencies. **Data Exploration Techniques:** Learning exploratory data analysis (EDA) methods to uncover patterns and trends in data. **Color Theory and Visual Encoding:** Understanding color theory and applying effective color palettes for clear communication.	**8**	**L1, L2, L3**
3	**Data Visualization using Excel Introduction to Excel Charts:** Creating basic and advanced charts in Excel (bar charts, line charts, pie charts, scatter plots). **Chart Customization and Formatting:** Fine-tuning chart elements (axes, labels, legends, titles) for optimal presentation. **Interactive Dashboards in Excel:** Building simple dashboards with charts and tables to present key findings.	**8**	**L1, L2, L3**
4	**Introduction to Advanced Visualization Tools** **Microsoft Power BI:** Exploring Power BI for data analysis and creating interactive visualizations. **Tableau Desktop:** Introduction to Tableau's interface and building basic visualizations with its drag-and-drop functionality. **Python for Data Visualization:** Learning the basics of	**8**	**L1, L2, L3**

	Python libraries like Matplotlib and Seaborn for creating customized visualizations. (**Note:** Basic programming experience is recommended)		
5	**Design for Impact and Evaluation** **Design Principles for Effective Visualizations:** Applying design principles (clarity, hierarchy, simplicity, etc.) to create impactful presentations. **Data Visualization Best Practices:** Understanding common pitfalls and best practices for creating effective data visualizations. **Evaluating Visualizations:** Learning how to critique and evaluate existing visualizations for clarity, accuracy, and effectiveness.	**8**	**L1, L2, L3**

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

CO1	Understand Principles of Data Visualization
CO2	Master Visualization Tools and Techniques
CO3	Data Preparation and Preprocessing
CO4	Interactive and Dynamic Visualizations
CO5	Hands-on Project Experience

QUESTION PAPER PATTERN:

- The question paper will have ten questions.
- Each full question consisting of 20 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- The students will have to answer 5 full questions, selecting one full question from each module.**TEXT BOOKS:**

1. "Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics" by Nathan Yau
2. "Data Visualization in Excel: A Guide for Beginners, Intermediates, and Wonks" by Jon Schwabish.

REFERENCE BOOKS:

1. "The Functional Art: An Introduction to Information Graphics and Visualization" by Alberto Cairo
2. "Show Me the Numbers: Designing Tables and Graphs That Communicate Effectively" by Stephen Few

INDUSTRIAL MANAGEMENT						
Course Code	231M34				CIE Marks	50
Number Lecture Hour/Week				TOTAL	SEE Marks	50
	3	0		3		
Number of Lecture Hours	40				Exam Hours	03
Credits-3						

MODULE NO.	TOPICS	TEACHI HOURS	RBT LEVELS
1	Introduction to Industrial Management Industrial Management: Meaning, Definition, Objective, Need, Scope, Evolution and developments., Evolution of Management Principles, Definition of Management and Functions — Approaches to the study of Management — Mintzberg's Ten Managerial Roles — Principles of Taylor; Fayol; Weber; Parker — Forms of Organization: Sole Proprietorship; Partnership; Company (Private and Public); Cooperative — Public Sector Vs Private Sector Organization — Business Environment: Economic; Social; Political; Legal — Trade Union: Definition; Functions; Merits & Demerits.	08	Ll,L2, L3
2	Functions of Management — Planning, Organizing, Staffing Planning: Characteristics; Nature; Imponance; Steps; Limitation; Planning Premises; Strategic Planning; Vision & Mission statement in Planning Organizing: Organizing Theory; Principles; Types; Departmentalization; Centralization and Decentralization; Authority & Responsibility — Staffing: Systems Approach; Recruiting and Selection Process; Human Resource Development (HRD) Concept and Design.	08	Ll,L2,

3	Functions of Management Directing, Communication, and Controlling Directing (Leading): Leadership Traits; Style; Morale; Managerial Grids (Blake-Mounton, Reddin) — Communication: Purpose; Model; Barriers — Controlling: Process; Types; Levels; Guidelines; Audit (External, Internal, Merits); Preventive Control — Decision Making: Elements; Characteristics; Nature; Process; Classifications.	08	Ll,L2,
4	Organization Theory Organizational Conflict: Positive Aspects; Individual; Role; Interpersonal; Intra Group; Inter Group; Conflict Management — Maslow's hierarchy of needs theory; Herzberg's motivation-hygiene theory; McClelland's three needs motivation theory; Vroom's valence-expectancy theory — Change Management: Concept of Change; Lewin's Process of Change Model; Sources of Resistance; Overcoming Resistance; Guidelines to managing Conflict.	8	Ll,L2,
5	Productivity and Modern Topics in Industrial Management Productivity: Concept; Measurements; Affecting Factors; Methods to Improve — Modern Topics (concept, feature/characteristics, procedure, merits, and demerits): Business Process Reengineering (BPR); Benchmarking; SWOT/SWOC Analysis; Total Productive Maintenance; Enterprise Resource Planning (ERP); Management of Information Systems (MIS), Industry 4.0.	8	Ll,L2,

PROJECT III

[As per NEP,OBE Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2023 -2024)
SEMESTER – III

Subject Code	23SCS35	**CIE Marks**	50
Number of Lecture Hours/Week	_____	**SEE Marks**	50
Total Number of Lecture Hours	03 hours per lab	**Exam Hours**	03

CREDITS – 02

Course objectives: This course will enable students to

Enable the student to design, develop and analyze an application development

The student will carry out a mini project relevant to the course. The project must be development of an application (Hardware/Software). It is preferable if the project is based on mobile application development.

Conduction of Practical Examination:

The student shall prepare the report by including:

1Define project (Problem Definition)

2Prepare requirements document

- Statement of work
- Functional requirements
- Software / Hardware requirements

.3. Develop use cases

6 Research, analyze and evaluate existing learning materials on the application

7 Develop user interface and implement code

6 Prepare for final demo

Evaluation:

Evaluation shall be taken up at the end of the semester.
Project work evaluation and viva-voce examination shall be conducted.
Internal evaluation shall be carried by the Guide and Head of the department for 50 marks.
Final examination which includes demonstration of the project and viva voce shall be conducted for 50 Marks viz report + Outputs of the project + presentation

COURSE OUTCOME:

Co1:: Identify and Finalize problem statement by surveying variety of domains.

CO2: Perform requirement analysis and identify design methodologies

CO3: Apply advanced programming techniques

CO4: Present technical report by applying different visualization tools and Evaluation metrics.

PROJECT III

[As per NEP,OBE Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2023 -2024)
SEMESTER – III

Subject Code	23SCS35	**CIE Marks**	50
Number of Lecture Hours/Week	_____	**SEE Marks**	50
Total Number of Lecture Hours	03 hours per lab	**Exam Hours**	03

CREDITS – 02

Course objectives: This course will enable students to

- Enable the student to design, develop and analyze an application development

The student will carry out a mini project relevant to the course. The project must be development of an application (Hardware/Software). It is preferable if the project is based on mobile application development.

Conduction of Practical Examination:

The student shall prepare the report by including:

1Define project (Problem Definition)

2Prepare requirements document

- Statement of work
- Functional requirements
- Software / Hardware requirements

.3. Develop use cases

8 Research, analyze and evaluate existing learning materials on the application

9 Develop user interface and implement code

6 Prepare for final demo

Evaluation:

- Evaluation shall be taken up at the end of the semester.
- Project work evaluation and viva-voce examination shall be conducted.
- Internal evaluation shall be carried by the Guide and Head of the department for 50 marks.
- Final examination which includes demonstration of the project and viva voce shall be conducted for 50 Marks viz report + Outputs of the project + presentation

COURSE OUTCOME:

Co1:: Identify and Finalize problem statement by surveying variety of domains.

CO2: Perform requirement analysis and identify design methodologies

CO3: Apply advanced programming techniques

CO4: Present technical report by applying different visualization tools and Evaluation metrics.

PROJECT III

[As per, NEP, Outcome Based Education(OBE) and Choice Based Credit System (CBCS)]
(Effective from the academic year 2023 -2024)
SEMESTER – III

Course Code	23SCS35	**CIE Marks**	50
Number of Lecture Hours/Week	4	**SEE Marks**	50
Total Number of Lecture Hours	-	**Exam Hours**	03

CREDITS – 02

Course objectives: This course will enable students to

- Enable the student to design, develop and analyze an application development.

The student will carry out a mini project relevant to the course. The project must be development of an application (Hardware/Software).

Conduction of Practical Examination:

The student shall prepare the report by including:

7. Define project (Problem Definition)
8. Prepare requirements document
   - Statement of work
   - Functional requirements
   - Software / Hardware requirements
9. Develop use cases
10. Research, analyze and evaluate existing learning materials on the application
11. Develop user interface and implement code
12. Prepare for final demo

Evaluation:

- Internal evaluation shall be carried by the Guide and Head of the department for 50 marks.
- Final examination which includes demonstration of the project and viva voce shall be conducted for 50 Marks
- report + Outputs of the project + presentation

Course outcome:

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

Co1:: Identify and Finalize problem statement by surveying variety of domains.

CO2: Perform requirement analysis and identify design methodologies

CO3: Apply advanced programming techniques

CO4: Present technical report by applying different visualization tools and Evaluation metrics.