DAYANANDA SAGAR COLLEGE OF ENGINEERING

An Autonomous Institute Affiliated to VTU, Belagavi Approved by AICTE ; ISO 9001:2015 Certified
Accredited by National Assessment Accreditation Council (NAAC) with 'A' grade
Shavige Malleshwara Hills, Kumaraswamy Layout, Bengaluru-560078

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
SCHEME - 2020

IV SEMESTER

Sl. No	Course Code	Course Title	Teaching Department	Teaching Hours/Week			Examination			Credits
				L	T	P	CIE	SEE	Total	
1	20AI4DCFMC	Foundation in Mathematics for Computing	MAT	3	0	0	50	50	100	3
2	20AI4DCDAA	Design and Analysis of Algorithms	AI&ML	4	0	0	50	50	100	4
3	20AI4DCMLA	Machine Learning with Applications	AI&ML	3	0	0	50	50	100	3
4	20AI4DCCOJ	Core JAVA	AI&ML	3	0	0	50	50	100	3
5	20AI4DCCON	Computer Networks	AI&ML	3	0	0	50	50	100	3
6	20AI3DCDBM	Database Management Systems	AI&ML	3	0	0	50	50	100	3
7	20AI4DLMLL	Machine LearningLab with Applications	AI&ML	3	0	0	50	50	100	3
8	20AI4DLDBL	Database Management Systems Laboratory	AI&ML	0	2	2	50	50	100	2
9	20HS4ICKAN/ 20HSS4ICCIP	Kannada/CIPE	HSS	1	0	0	50	--	50	1
	Total			20	04	04	450	400	850	24
Course Prescribed to lateral entry Diploma holders admitted to III Semester of Engineering Programs										
10	20MA4IMMAT	Advanced Mathematics-II	MAT	4	0	0	50	--	50	0

a) The mandatory non – credit courses Advance Mathematics- I and II prescribed at III and IV semesters respectively, to lateral entry Diploma holders admitted to III semester of BE/B.Tech programs shall compulsorily be registered during respective semesters to complete all the formalities of the course and appear for examination.

b) The mandatory non – credit courses Advance Mathematics I and II, prescribed to lateral entrant Diploma holders admitted to III semester of BE/B.Tech programs, are to be completed to secure eligibility to VII semester. However, they are not considered for vertical progression from II year to III year of the programme.

FOUNDATION IN MATHEMATICS FOR COMPUTING

Course code: 20AI4DCFMC
L: P: T: S: 3: 0: 0: 0
Exam Hours: 03
Total Hours: 40

Credits: 03
CIE Marks: 50
SEE Marks: 50

Course Objectives:
1. To introduce Vector Spaces and Linear Transformation
2. To explain Curve fitting and introduce to the concept of Statistical Analysis
3. To provide the foundations of probabilistic and statistical analysis mostly used in varied.

Course Outcomes: At the end of the course, student will be able to:

CO1	Understand the concept of Vector Spaces and its applications
CO2	Solve Differential equation and Discrete Dynamical system using the concept of Eigen value and Eigen Vector
CO3	Understand the concept of Statistical Modelling.
CO4	Analyze data using Correlation and Regression.
CO5	Understand the basic concepts of random variables and probability distributions.
CO6	Explain sampling distributions and test the hypothesis for a given sample.

Module	Contents of the Module	Hours	CO's
1	Eigen Values and Eigen Vectors: Review of Characteristic Equation, Eigen Values and Eigen Vectors, Diagonalization, Orthogonal Transformation, Quadratic to Canonical and Its Applications. (RBT Levels:L1&L2)	08	CO1
2	Vector Spaces: Vector spaces and Subspaces. Null Spaces, Column Spaces and Linear Transformation. Linearly independent sets; Bases, Dimension of Vector Space, Rank. Applications. (RBT Levels:L1&L2)	08	CO2
3	Statistics: Statistics Modeling: Analyzing a data – Mean, Mode, Median, Standard Deviation-Combination of two groups, correlation, Covariance, Linear regression and its application. (RBT Levels:L1&L2) regression. Application Problems	08	CO3, CO4
4	Probability Distributions: Types of variables, Probability Mass & Density function, Mean & Variance of random and continuous variable, Geometric distribution, Poisson distribution& Exponential and Normal distributions, and its application. (RBT Levels:L1&L2)	08	CO5
5	Sampling Distribution and Optimization Technique : Sampling distribution, Central limit theorem, Sampling with & without replacement, Confidence limits for means, Student's t distribution, Gradient descent algorithms-batch, mini batch, stochastic, their performance comparison. (RBT Levels:L1&L2)Gradient descent algorithms-batch, mini batch, stochastic, their performance comparison.	08	CO6

Self-Study Components:

- Module 1: Explore on Complex Eigenvectors
- Module 2: σ properties and its applications
- Module 3: Statistics-Measures of central tendency
- Module 4: Probability Concepts-Addition and Multiplication law of probability
- Module 5: F-test and 2-test

Text Books:
1. B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 2014 June, ISBN: 9788174091956.
2. Erwin Kreyszig; Advanced Engineering Mathematics; John Wiley & Sons, 9th Edition, 2007, ISBN: 9788126531356.
3. Gilbert Strang, Linear Algebra and its Applications, 4th edition, Cengage Publishers , 2014, ISBN: 9788131501726.
4. David C Lay, "Linear Algebra and Application", Pearson Education, ISBN-9788177583335

Reference Books:
1. B.V.Ramana, "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006;

ISBN:9780070634190.
2. Kenneth Hoffmann, Ray Kunze, Linear Algebra, 2Nd Edition, Prentice Hall India Learning Private Limited, 1978. ISBN-13: 978-0135367971.
3. Murray Speigel, Schaum's Outline of "Advanced Mathematics for Engineers and Scientists"McGraw-Hill, 1971; ISBN: 9780070602168.
4. Schaum's Outline: Introduction to Probability and Statistics**,** McGraw Hill Education (India) Private Limited (1 September 2005); ISBN-13: 978-0070605015.

Web links and Video Lectures:
1. http://nptel.ac.in/courses/111104079/
2. http://nptel.ac.in/video.php/subjectId=117105085
3. http://nptel.ac.in/syllabus/111105041

DESIGN AND ANALYSIS OF ALGORITHMS

Course code: 20AI4DCDAA   Credits: 04
L: P: T: S: 4:0:0:0   CIE Marks: 50
Exam Hours: 03   SEE Marks: 50
Total Hours: 50

Course Objectives:
1. The student will be able to understand and use asymptotic notation to formulate the time and space requirements of algorithms.
2. The student will be able to analyze and compare complexity for different types of algorithms for different types of problems.
3. The student will be able to apply and implement major different algorithm design techniques to solve problems and analyze time complexity of those problems.
4. Ability to apply and implement learned algorithm design techniques and data structures to solve problem.

Course Outcomes: At the end of the course, student will be able to:

CO1	Understand and explore the asymptotic runtime complexity of algorithms by using mathematical relations.
CO2	Select and apply appropriate design techniques to solve real world problems
CO3	Estimate the computational complexity of different algorithms.
CO4	Devise an algorithm using appropriate design strategies for problem solving
CO5	Ability to conduct practical experiments to solve problems using an appropriate designing method and find time efficiency.

Unit	Contents of the Unit	Hours	COs
1	What is an algorithm, Fundamentals of Algorithmic Problem Solving. Fundamentals of the Analysis of Algorithm Efficiency: The Analysis Framework, Asymptotic and Basic Efficiency Classes, Mathematical Analysis of Non recursive, Algorithms Mathematical Analysis of Recursive Algorithms.	10	CO1 CO2
2	Divide-And-Conquer: Introduction, Master theorem, Quick sort, Mergesort, Multiplication of Large Integers and Strassen's Matrix Multiplication. DECREASE-AND-CONQUER: Representation of Graphs, Insertion Sort, Depth-First Search and Breadth-First Search, Topological Sorting. Competitive Programming Practices on Divide-And-Conquer and Decrease-And-Conquer.	10	CO3 CO4
3	Space And Time Trade-Offs: Introduction, Sorting by Counting, Input Enhancement in String Matching. Dynamic Programming: Introduction, Warshall's and Floyd's Algorithms, Travelling sales person problem. Competitive Programming Practices on Dynamic Programming	10	CO3 CO4 CO5

4	Graph Algorithms: Flow networks, Max Flow Min cut theorem. Greedy Technique: Introduction, The Bellman – Ford Algorithm, Prim's Algorithm, Kruskal'sAlgorithm, Dijkstra's Algorithm,An activity-selection problem, Huffman codes. Competitive Programming Practices on Greedy Technique	10	CO3 CO4 CO5
5	The Limitations Of Algorithm Power And Coping: Lower-Bound Arguments, Decision Trees, P, NP, and NP Complete Problems. Backtracking& Branch-And-Bound: nqueens problem, sum of subset, assignment problem. Approximation Algorithms for NP-Hard Problems. Competitive Programming Practices on Backtracking and Branch and Bound	10	CO3 CO5 CO6

Text Books:
1. Introduction to the Design and Analysis of Algorithms, Anany Levitin, Third Edition, Pearson, 2011.
2. Introduction to Algorithms, Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, Third Edition, the MIT Press, 2009.

Reference Books:
1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekhara m, 2nd Edition, University Press Pvt. Ltd, 2009.
2. Analysis and design of Algorithms, Padma Reddy, Sri Nandi Publications, 2009.

Machine Learning With Applications

Course code: 20AI4DCISL   Credits: 03
L: P: T: S: 3: 0: 0: 0   CIE Marks: 50
Exam Hours: 03   SEE Marks: 50
Total Hours: 40

Course objectives:

1. Comprehend the fundamentals of Machine & Statistical Learning
2. Assessing Model Accuracy, Measuring the Quality of Fit various
3. This course involves introduction to Statistical learning and their applications.

Course Outcomes: At the end of the course, student will be able to:

CO1	Comprehend the working of Statistical Learning models.
CO2	Compare and apply linear regression models to solve real life problems.
CO3	Analyze and apply classification algorithms efficiently.
CO4	Analyze and apply resampling methods.
CO5	Understand Linear Model Selection and Regularization.
CO6	Evaluate and select suitable regression techniques for problem solving.

nit	Contents of the Unit	Hours	CO's
1.	**Introduction to Machine Learning:** What Is Machine Learning?, Why Use Machine Learning?, Types of Machine Learning Systems: Supervised/Unsupervised Learning, Instance-Based Versus Model-Based Learning, Main Challenges of Machine Learning.	8	CO1
2.	**Linear Regression:** Simple Linear Regression: Estimating the Coefficients, assessing the Accuracy of the Coefficient Estimates,assessing the accuracy of the Model ; Multiple Linear Regression: Estimating the Regression Coefficients ,some Important Questions; Model Interpretation, Goodness of fit, Assumption validation, Categories as predictors-i)Label Encoding,ii)interaction, Model Subset (model Selection)	8	CO2
3.	**Logistic regression:**Why not linear regression,The Logistic model: Estimating the Regression Coefficients,Making Predictions,Multiple Logistic Regression,Logistic Regression for >2 Response Classes . Goodness of fit-i)Confusion matrix ii)Precision iii)Recall iv)F1 Score v)ROC / AUC	8	CO3
4.	**Decision Tree:** Entropy, GINI,Working of single Decision Tress,The C5.0 Algorithm,CART and CHAID algorithm,Pruning (ML-2)	8	CO4
5.	**Clustering:** The Challenge of Unsupervised Learning, Principal components Analysis: What Are Principal Components?,Another Interpretation of Principal Components,More on PCA,Other Uses for Principal Components; Clustering Method : K-Means Clustering ,Hierarchical Clustering,Practical Issues in Clustering.	8	CO5, CO6

Text books:

1. Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems by Aurélien Géron
2. An Introduction to Statistical Learning, with Applications in R (2013), by G.James, D. Witten, T. Hastie, and R.   Tibshirani.

Reference Books:
1. Machine Learning with R - Second Edition, by Brett Lantz

CORE JAVA

Course code: 20AI4DCCOJ   Credits: 03
L: P: T: S: 3: 0: 0: 0   CIE Marks: 50
Exam Hours: 03   SEE Marks: 50
Total Hours: 40

Course Objectives:

1. Set up Java JDK environment to create, debug and run simple Java programs.
2. Learn principles of object-oriented language in Java.
3. Study the concepts of importing of packages, exception handling mechanism, handling Strings and Interfaces.
4. Study the chatbot creation using Java AIML.

Course Outcomes: At the end of the course, student will be able to:

CO1	Make use of fundaments of object-oriented programing structure and understand the basics of Java.
CO2	Inspect the class, constructor, inheritance and polymorphism concepts of Java with real time applications.
CO3	Analyze the different packages available in Java and implement them on the applications.
CO4	Discover String Library through Java Programming.
CO5	Determine the process of creation of chatbots using Java AIML.

Unit	Contents of the Unit	Hours	Cos
1	Fundamentals of Java, Programming in Java, Tools available for Java programming, Building application in Java	8	CO1
2	Object oriented mechanism in Java, Class, Constructor, Inheritance, Polymorphism in Java, Access Specification.	8	CO2
3	Interfaces, Packages, Exception handling in Java, Thread and Multithreading, Application development in Java.	8	CO3

4	String handling, String Constructors, String Operations, Character Extraction, String Comparison, Searching and Modifying Strings, StringBuffer, StringBuilder.	8	CO4
5	Java AIML(Artificial Intelligence Markup Language), Understanding NLP, Using the AIML Package, Creation of simple chatbots.	8	CO5

Text Books:

1. Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007.
2. Mahesh Bhave and Sunil Patekar, "Programming with Java", First Edition, Pearson Education,2008, ISBN:9788131720806.
3. Rajkumar Buyya,S Thamarasi selvi, xingchen chu, Object oriented Programming with java, Tata McGraw Hill education private limited.
4. Natural Language Processing with Java - Second Edition by Richard M. Reese, Ashish Singh Bhatia.

Reference Books:
1. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies.
2. Anita Seth and B L Juneja, JAVA One step Ahead, Oxford University Press, 2017.

COMPUTER NETWORKS

Course code: 20AI3DCCON   Credits: 03
L: P: T: S: 0:2:2:0   CIE Marks: 50
Exam Hours: 03   SEE Marks: 50

Course Objectives:

1. Provide basic understanding of elements in communication networks and IoT.

2. Understand the layered architecture of networks and protocols deployed.

3. Discuss the realtime implementation of the networking concepts.

Course Outcomes: At the end of the course, student will be able to:

CO1	Develop a basic framework/backbone network with adequate understanding of networking fundamentals.
CO2	Examine the protocols listed for the data link layer and implement the same in a simple network.
CO3	Discover the networking layer protocol and use them for creating a connected devices environment.
CO4	Analyse the concepts of transport and application layers with few protocols.
CO5	Explain IoT and Arduino programing with respect to few case studies related to important domains.

Module	Contents of the Module	Hours	CO's
1	Introduction to Computer Networking Concepts: Layered Network Protocol Architectures; Personal, Local, Metropolitan and Wide Area Networks; Telecommunications and Cellular Networks overview. Physical Layer: Basics of communications; Physical media types and their important bandwidth and bit-error-rate characteristics; Wired and Wireless media including copper cables, optical fiber and wireless. Use of Packet Tracer Online to understand the networking devices and their connection.	08	CO1

2	Data Link Layer and Logical Link Control (LLC) sub-layer: Framing; Error control including Bit-parity, CRC and Hamming Codes; Reliable transmission and Automatic Repeat Request (ARQ) protocols including Stop-and-Wait, Go-back-N, Selective Repeat. Performance analysis of ARQ protocols. Example protocols such as HDLC and PPP. Medium Access Control (MAC) sub-layer: Shared media systems; Bus, Star and Ring topologies; TDMA, FDMA, CSMA, CSMA/CD, Ethernet and IEEE 802.3; IEEE 802.11 including CSMA/CA protocols; Performance analysis; Shared and Switched Ethernet; Related protocols such as ICMP, NAT, ARP and RARP. Implementation of DLL error detection and control schemes in JAVA	08	CO2
3	Network Layer: Internet Protocol (IP) suite; Hierarchical network architectures; IPv4 and IPv6 addressing and headers; Routing protocols including distance-vector and link-state approaches; Interior and Exterior Gateway Protocol concepts; Routing Algorithms including Dijkstra's algorithm and distributed Bellman-Ford algorithm; Example protocols: OSPF, RIP, BGP. Presentation of social graphs and networks based on the protocols learnt.	08	CO3
4	Transport Layer: Reliable end-to-end transmission protocols; UDP header; Details of TCP header and operation including options headers and congestion control; TCP variants such as Reno, Tahoe, Vegas, Compound and CUBIC. Application Layer: Socket Interface and Socket programming; Example protocols such as DNS, SMTP, FTP, and HTTP. Real time multimedia application of TCP and HTTP	08	CO4

5	Definition and Characteristics of IoT, Physical Design of IoT: Things in IoT, IoT Protocols, Logical Design of IoT: IoT functional Blocks, IoT Communication Blocks, IoT Communication APIs, IoT Enabling Technologies: WSN, Cloud Computing, Big Data Analysis, Communication Protocols, Embedded Syesstems. Basics of Arduino: The Arduino Hardware, The Arduino IDE, Basic Arduino Programming. Home automation, Smart cities, Smart Environment, IoT in Energy, Logistics, Agriculture, Industry and Health & Life style secors. Case Studies: A Case study of Internet of Things Using Wireless Sensor Networks and Smartphones, Security Analysis of Internet-of-Things: A Case Study of August Smart Lock, OpenIoT platform. Certification or MOOC on IoT	08	CO5

Text Books:

1. Kurose and Ross, "Computer Networking - A top-down approach", Seventh Edition, Pearson, 2017.

2. Andrew S. Tanenbaum, "Computer Networks", Fifth Edition, Pearson Education India,2013.

3. Peterson and Davie, "Computer Networks, A Systems Approach", 5th ed., Elsevier, 2011.
4. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",

   1stEdition, VPT, 2014.

Reference Books:

1. Ying-Dar Liu, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open SourceApproach", McGraw-Hill, 2011.

2. W. Richard Stevens, Bill Fenner and Andrew Rudoff, "Unix Network Programming", Volumes 1 and 2, Third Edition, Addison-Wesley Professional, 2003.

3. Michael Donahoo, Ken Calvert, Pocket Guide to TCP/IP Socket Programming in C, Morgan Kaufmann Series in Networking, 2000.

DATABASE MANAGEMENT SYSTEMS

Course code: 20AI3DCDBM   Credits: 03
L: P: T: S: 0:2:2:0   CIE Marks: 50
Exam Hours: 03   SEE Marks: 50

Course objectives:
1. Understand the underlying principles of management.
2. To analyze and identify the functions of entrepreneurial activities and its prerequisites under practical conditions.
3. To develop and enhance one's decision making skills amidst competitive business market

Course Outcomes: At the end of the course, student will be able to:

CO1	Apply the basic concepts and create ER models for various applications.
CO2	Design relational database model for an application and use functional dependencies in normalizing the database schema.
CO3	Write queries using SQL commands.
CO4	Evaluate and optimize SQL queries for complex Relational Algebra operations.
CO5	Develop the database using recent technology MongoDB and Connectivity using python.

Unit	Contents of the Unit	Hours	CO's
1.	Introduction: Introduction; An example; Characteristics of Database approach; Advantages of using DBMS approach; Data models, schemas and instances; Three-schema architecture and data independence; Entity-Relationship Model: An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types, sample ER Diagrams.	8	CO1
2.	Relational Model and Relational Algebra: Relational Model Concepts, Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION.	8	CO2 & CO4
3.	SQL: SQL Data Definition and Data Types; Specifying basic constraints in SQL; Basic queries in SQL; More complex SQL Queries. Insert, Delete and Update statements in SQL, Views in SQL, Database programming issues and techniques.	8	CO3 & CO4

4.	Database Design: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms. NoSQL Databases:MongoDB: CRUD and Nesting, Indexing, Aggregating, Mapreduce, Replica Sets, Sharding, GeoSpatial, and GridFS;hbase;redis;neo4j	8	CO2 & CO5
5.	Database Connectivity: Using the mysql Client Program: Setting Up a MySQL User Account, Creating a Database and a Sample Table, What to Do if mysql Cannot Be Found, Specifying mysql Command Options, Executing SQL Statements Interactively, Executing SQL Statements Read from a File or Program, Controlling mysql Output Destination and Format, Using User-Defined Variables in SQL Statements; Writing MySQL-Based Programs: Connecting, Selecting a Database, and Disconnecting, Checking for Errors, Writing Library Files, Executing Statements and Retrieving Results, Handling Special Characters and NULL Values in Statements, Handling Special Characters in Identifiers, Identifying NULL Values in Result Sets, Techniques for Obtaining Connection Parameters; Big Data Analytics and NoSQL; Database Connectivity and Web Technologies.	8	CO6

Text Books:
1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Pearson Education, 2007.
2. Paul DuBois: MySQL Cookbook,3rd edition, O'Reilly.
3. Luc Perkins with Eric Redmond and Jim R. Wilson: Seven Databases in Seven Weeks, Second Edition, A Guide to Modern Databases and the NoSQL Movement,
4. Carlos Coronel and Steven Morris: DATABASE SYSTEMS Design, Implementation, and Management

Reference Books:
1. Silberschatz, Korth and Sudharshan: Database System Concepts, 6th Edition, Mc-GrawHill, 2010.
2. C.J. Date, A. Kannan, S. Swamynatham: An Introduction to Database Systems, 8th Edition, Pearson Education, 2006.

MACHINE LEARNING LABORATORY

Course code: 20AI3DLMLL | Credits: 02
L: P: T: S: 0:2:2:0 | CIE Marks: 50
Exam Hours: 03 | SEE Marks: 50

Course Objectives:

1. Make use of Data sets in implementing the machine learning algorithms
2. Implement the machine learning concepts and algorithms in any suitable language of Choice.

Course Outcomes: At the end of the course, student will be able to:

CO1	Understand the implementation procedures for the machine learning algorithms.
CO2	Design Java/Python programs for various Learning algorithms.
CO3	Apply appropriate data sets to the Machine Learning algorithms.
CO4	Identify and apply Machine Learning algorithms to solve real world problems.

Experiment No.	Contents of the Experiment	Hours	CO's
1.	Apply: a) Simple linear regression model for Boston House Pricing dataset and predict given data points Find out (i) Split data (train / test) (ii) R^2 /Adj R^2 score for the predicted model (iii) Assumptions of Linear Regression (iv) Identify significant variables (v) Display all the data points along with the fit model	2	
2.	Apply: a) Simple linear regression model for dataset and predict given data points Find out (i) Split data (train / test) (ii) R^2 /Adj R^2 score for the predicted model (iii) Assumptions of Linear Regression (iv) Identify significant variables (v) Display all the data points along with the fit model	2	
3.	Apply:	2	

		a) Logistic Regression model for Telecom Churn and predict given data points Find out (i) Split data (train / test) (ii) Identify significant variables (iii) Model evaluation matrix (precision, recall, F1 score, confusion matrix, accuracy, ROC, AUC) (iv) Selecting the best model (v) Display all the data points along with the fit model		
4.		Apply: a) Logistic Regression model for dataset and predict given data points Find out (i) Split data (train / test) (ii) Identify significant variables (iii) Model evaluation matrix (precision, recall, F1 score, confusion matrix, accuracy, ROC, AUC) (iv) Selecting the best model (v) Display all the data points along with the fit model	2	
5.		a) Apply : K-Means, K-Means++ on Credit Card Usage with different K (number of clusters) as input and record the output. Validation on number of clusters Selecting best model	2	
6.		b) Apply : K Mode Algorithm Density based Clustering- DBSCAN clustering technique on Bank Marketing Dataset with different K (number of clusters) as input and record the output. Validation on number of clusters Selecting best model.	2	
7.		Apply CHAID, CART & C5.0 for Car Evaluation Dataset and predict given data points Find out (i) Split data (train / test) (ii) Model evaluation matrix (precision, recall, F1 score, confusion matrix, accuracy, ROC, AUC) (iv) Selecting the best model (v) Display all the data points along with the fit model	2	
8.		Apply: a) CHAID, CART & C5.0 for dataset and predict given data points Find out	2	

	(i) Split data (train / test) (ii) Model evaluation matrix (precision, recall, F1 score, confusion matrix, accuracy, ROC, AUC) (iv) Selecting the best model (v) Display all the data points along with the fit model		

DATABASE MANAGEMENT SYSTEMS LABORATORY WITH MINI PROJECT

Course code: 20AI3DLDBL   Credits: 02
L: P: T: S: 0:2:2:0   CIE Marks: 50
Exam Hours: 03   SEE Marks: 50

Course Objectives:
1. Understand fundamentals of database programming such as tables, constraints and queries
2. Understand fundamentals of database programming using SQL, including Data definition languages, Data manipulation languages, Transaction control and data control.
3. A deep understanding of data retrieval language to solve complex queries.

Course Outcomes: At the end of the course, student will be able to:

CO1	Implement solutions using database management systems.
CO2	Design and implement a database schema for a given problem description.
CO3	Create,insert, update a database using SQL DDL commands.
CO4	Develop the project using MongoDB,python flask,POSTMAN tool and GIT
CO5	Contribute to the team as a member, lead the team.

PART A

Experiment No.	Contents of the Experiment	Hours	COs
1	Consider the schema for CollegeDatabase: STUDENT (USN, SName, Address, Phone, Gender) SEMSEC (SSID, Sem, Sec) CLASS (USN, SSID) SUBJECT (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 '1DC20AI001' in all subjects. 4. Calculate the Final IA (average of best two test marks) and update the corresponding table for all students. 5. Categorize students based on the following criterion: If Final IA = 17 to 20 then CAT ='Outstanding' If Final IA = 12 to 16 then CAT = 'Average' If Final IA< 12 then CAT = 'Weak' Give these details only for 8th semester A, B, and C section students.	06	CO1, 2,3,4,5 & CO6
2	Consider the schema for Company Database: EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN,DNo) DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate)	06	CO1, 2,3,4,5 &

		DLOCATION (DNo,DLoc) PROJECT (PNo, PName, PLocation, DNo) WORKS_ON (SSN, PNo, Hours) a) 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. b) Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise. c) 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 d) Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator). e) 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.		CO6
3		Puppy pet shop wants to keep track of dogs and their owners. The person can buy maximum three pet dogs. We store person's name, SSN and address and dog's name, date of purchase and sex. The owner of the pet dogs will be identified by SSN since the dog's names are not distinct. a) Establish the database by normalizing up to 3NF and considering all schema level constraints b) Write SQL insertion query to insert few tuples to all the relations c) List all pets owned by a person 'Abhiman'. d) List all persons who are not owned a single pet e) Write a trigger to check the constraint that the person can buy maximum three pet dogs f) Write a procedure to list all dogs and owner details purchased on the specific date.	06	CO1, 2,3,4,5 & CO6
4		The commercial bank wants keep track of the customer's account information. The each customer may have any number of accounts and account can be shared by any number of customers. The system will keep track of the date of last transaction. We store the following details. a) Account: unique account-number, type and balance b) Customer: unique customer-id, name and several addresses composed of street, city and state a) Establish the database by normalizing up to 3NF and considering all schema level constraints b) Write SQL insertion query to insert few tuples to all the relations c) Add 5% interest to the customer who have less than 10000 balances and 6% interest to remaining customers. d) List joint accounts involving more than three customers e) Write a insertion trigger to allow only current date for date of last transaction field. f) Write a procedure to find the customer who has highest number of accounts, the customer who has lowest balance, the customer who involved in most of joint accounts.	06	CO1, 2,3,4,5 & CO6

| 5 | The XYZ Book shop wants keep track of orders of the book. The book is composed of unique id, title, year of publication, single author and single publisher. Each order will be uniquely identified by order-id and may have any number of books. We keep track of quantity of each book ordered. We store the following details for author and publisher. AUTHOR: unique author-id, name, city, country PUBLISHER: unique publisher-id, name, city, country.
  a) Establish the database by normalizing up to 3NF
  b) Write SQL insertion query to insert few tuples to all the relations
  c) Find the author who has published highest number of books
  d) List the books published by specific publisher during the year 2011.
  e) Write before insertion trigger to book to check year of publication should allow current year only.
  f) Write a procedure to list all the books published by a specific author during the specific year | 06 | CO1, 2,3,4,5 & CO6 |

PART B

Develop a suitable database minor project for solving a real life problem using the skills learnt in the DBMS theory,the exercises indicated in Part A and using new technologies MongoDB,Python Flask and post development tools .

Instructions:

For Part A:

1. The exercises are to be solved in an RDBMS environment like Oracle or MySQL

2. Suitable tuples have to be entered so that queries are executed correctly.

3. The results of the queries may be displayed directly.

4. Relevant queries other than the ones listed along with the exercises may also be asked in the regular lab and examination.

5. Questions must be asked based on lots.

For Part B:

1. Front end may be created using either VB/HTML/JAVA/React any other similar tool.

2. Back end using oracle/DB2/SQL/MYSQL/MongoDB/Python Flask .

3. Post development using POSTMAN tool,GIT

In the examination, one exercise from Part A is to be asked for a total of 20 marks. The mini project developed under Part B has to be evaluated for a total of 30 marks.