YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS

DEPARTMENT OF B.Sc. COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE

THIRD SEMESTER

ACADEMIC YEAR 2024-25 OF 2023-26 BATCH (CBCS)

Sl. No.	Part	Course Code	Title of the Course	Hours /Week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
1	I	ES23301	Environmental Studies and Gender Sensitization (AECC-5)	3	3	40	60	100	3
2	II	G22CSAI1T	LISP Programming (GE-2) (ID)	2	3	40	60	100	2
3	II	CSAI22301	Distributed Systems (CORE -6)	4	3	40	60	100	4
4	II	CSAI22302	Database Management Systems(CORE -7)	4	3	40	60	100	4
5	II	CSAI22303	Python Programming(Core-8)	5	3	40	60	100	4
6	II	CSAI22304	Artificial Intelligence (Core-9)	4	3	40	60	100	4
PRACTICALS									
7	II	G22CSAI1P	LISP Programming (GE-2) (ID)	2	3	40	60	100	1
8	II	CSAI22305	Database Management Systems (CORE -7)	2	3	40	60	100	1
9	II	CSAI22306	Python Programming Lab (CORE -8)	2	3	40	60	100	1
10	II	CSAI22307	Artificial Intelligence Lab (CORE-9)	2	3	40	60	100	1
	Total			**30**	**-**	360	540	900	**25**

*Ability Enhancement CompulsoryCourse(AECC)

* Generic Elective (GE)

GENERIC ELECTIVE
INTER-DEPARTMENTAL/INTER-DISCIPLINARY
UG COURSES FOR AY 2024-25

S.No	NAME OF THE DEPARTMENT	GE COURSE
1	B.Sc Chemical Technology	Solar processing techniques
2	B.Sc.(Hons) Agriculture	Principles of Organic farming
3	B.Sc Computer Science &Engineering	PC Operating Systems
4	B.Com Honors	Taxation
5	B.Sc Computer Science & Information Technology	PC Hardware and Software installation
6	B.Com Marketing	Principles of Marketing
7	B.Sc. Biotechnology, Chemistry & Genetics	Medical lab technology
8	B.A (Hons) Mass Communication	Film Appreciation
		Photography
9	B.Sc Food Technology & Management	Food Processing & Quality Control
10	B.A Psychology,English Literature & Journalism	Communication Skills
		Career Skills
		Psychology for living
11	B.Sc Mathematics,Statistics &Computer Science	Quantitative Aptitude
		Statistics - Data Analysis
12	B.Sc Multimedia & Animation	Creative Arts
13	B.Com.Computer Applications	Accounting
14	BBA	Principles of Management
15	B.Com.International Finance	Project Management
16	B.Sc Computer Data Science & Data Analytics Engineering	Python Programming
17	B.Com.(Hons)Strategic Finance	Goods and Services Tax
18	B.Com.Business Process Management	Financial markets
19	B.Sc Food Science Nutrition &Dietetics	Principles of Nutrition and Dietetics
20	B.Com Business studies	Banking
21	B.Sc Computer Science &Cognitive Systems	Introduction to worksheets
22	B.Com.Business Analytics	Principles of Insurance
23	B.Sc (Hons)Computer Science &Artificial Intelligence	LISP programming
24	B.Sc (Hons) Computer Science &Cyber Security	Principles of Information Security
25	B.A Economics ,Public Administration & Computer Science	Human Rights
26	B.Com Information Systems	Human Resource Management
27	B.Sc Computer Science &Cloud Computing	Web Programming
28	B.Sc Computer Science &Internet of Things	Introduction to IOT using Arudino
29	BBA Entrepreneurship Development	Startup Management
30	BBA Retail Operation Management	Consumer Behavior
31	B.Sc Computer Science & Machine Learning	ML for everyone
32	BBA Tourism	Tourism Management

ENVIRONMENTAL STUDIES&GENDER SENSITIZATION

Credits: 3 **Semesters: III**
Subject Code: ES23301 **No. of lecture hours: 45**

Objectives:

- To understand the importance of ecological balance for Sustainable Development
- To understand the impacts of developmental activities and mitigation measures
- To understand the environmental policies and regulations.
- To develop students' sensibility with regard to issues of gender in contemporary India
- To provide a perspective on the socialization of men and women
- To expose the students to debate on the politics and economic works and on gender violence.

Outcome:
Students will gain knowledge on environmental aspects and involve themselves in acquiring a sustainable environment.
Students will be sensitized towards gender issues in the society and the laws enforced for their protection.

Course Outcomes:

COl: Understand the importance of Environmental education, conservation of natural resources & understand the importance of ecosystems and biodiversity.
CO2: Understand the pollution problems and apply the environmental science knowledge on solid waste management, disaster management.
C03: Apply the environmental science knowledge to improve the resources Evaluate and understand the sustainable environmental conditions and control methods.
C04: Identify the interactions and inter sections of identities (e.g., gender, race, ethnicity class, sexuality, and so on) and assess the ways in which they contribute to instances of privilege and power dynamics across cultures, space, and time. And their problems
CO5: Understand the gender problems and ways of addressing them, including interactions across local to global scales in communities and overcome inequalities with legislation

UNIT-I

NATURAL RESOURCES, ECOSYSTEMS & BIODIVERSITY **9hr**

• Definition, Scope and importance of environmental studies. Need for public awareness.
• Renewable & Non-Renewable resources, Brief account on Forests, Water, Minerals and Energy (Solar, Wind, and Geo-thermal & Bio-energy).
• Definition of Ecosystem, Structure and functions-food chains, food webs, ecological pyramids, producers, consumers and decomposers. Energy flow and example ecosystems---Forest, Desert, Aquatic ecosystem
• Definition of Biodiversity, types (Genetic, Species, Ecosystem), India-mega diversity Nation.
• Hotspots, Threats to biodiversity, Conservation of biodiversity (In-Situ and Ex-Situ).

UNIT-II

ENVIRONMENTALPOLLUTION **9hrs**

• Definition of Environmental pollution

• Brief account on causes, effects, prevention and control measures of

(a) Air pollution

(b) Water Pollution

(c) Soil pollution

(d) Noise pollution

UNIT-III

Social Issues and Environment **9hrs**

- Rain-Water Harvesting, Water-shed Management, and From Unsustainable to Sustainable Development.
- Global Warming, Ozone depletion, and Acid rains
- Environmental Legislation: Air Act, Water Act, Environmental Protection Act, Forest Act, Wildlife Act.
- Environmental & Human Health-HIV/AIDS
- Welfare Programs-Family, Women & Child Welfare, Population Explosion
- Role of Information Technology in Environmental Studies.

UNIT-IV

Gender Studies **9hrs**

- Why should we study gender issues?
- Socialization-Making women and making men
- Being together as equals-Through the lens of gender
- Missing women: Gender selection and its consequences
- Health issues of Women

UNIT-V

Gender & Labour -Gender Violence & Law **9hrs**

- Housework: The invisible labour-my mother doesn't work "share the load"
- Women's Work: Role in Politics and Economics Fact and Fiction. Unrecognized and Unaccounted work. Wages and Conditions of Work.
- Sexualharassment–saynoeveteasing–thecaste-basedviolence–NirbhayaAct
- Domestic violence-Is home a safe place? - Blaming the victim. -Domestic violence Act
- Forums of justice-Hindu Inheritance Act (2005)

SUGGESTEDREADING:

- A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu. 201. **Towards a World of Equals: A Bilingual Text on Gender**. Hyderabad: Telugu Akademi.
- Rajagopalan R.2015. **Environmental Studies-from Crisis to Cure.** Third Edition. Chennai: Oxford University Press.
- Dr D K Asthana and Dr Meera Asthana. 2014. **A Text Book of Environmental Studies** Revised Edition. New Delhi: S.Chand & Company.
- Anubha Kaushik and C.P. Kaushik Published. 2016. **Perspectives in Environmental Studies.** Fifth Edition. New Delhi: New Age International.

(for Gender Sensitization)

- Sen Amartya **More Than One Million Women Are Missing.** New York Review of Books 37.20

(e) Marine pollution

- Solid Waste Management: Causes, Effects & Control measures of urban and industrial wastes
- Disaster Management: floods, Earthquakes, and Cyclones.

LISP PROGRAMMING
(GE Inter-Disciplinary)

Credits: 2 **Semester: III**
Course Code : G22CSAI1T **No. of Lecture Hrs: 30**

Course Objective: To understand the programming concepts and constructs of LISP.

Course Outcomes: Students will be able to

CO1: Understand basics of LISP and installation
CO2: Implement the structure and components of a LISP program
CO3: Interpret how to write and implement Functions in program
CO4: Create programs involving arrays and strings
CO5: Develop programs related to file operations and error handling.

	UNIT-I	**6Hrs**
1.	LISP- Overview, Environment setup	2
2.	Basic syntax, data types	2
3.	Macros, variables and constants	2
	UNIT-II	**6Hrs**
1.	Operators (Arithmetic, comparison, logical and bitwise)	2
2.	Decision structures- cond, if, when and case	2
3.	Loops- loop, loop for, do, dotimes and dolist	2
	UNIT-III	**6Hrs**
1.	Functions in LISP	2
2.	Predicates	2
3.	Number and characters	2
	UNIT-IV	**6Hrs**
1.	Arrays and strings	2
2.	sequences, lists, symbols	2
3.	Vectors, set, Tree and Hash table	2
	UNIT-V	**6Hrs**
1.	Input/output, File I/O	2
2.	Structures, packages	2
3.	Error Handling and classes (CLOS)	2

SUGGEST READING

1. Vindarel. 2021. **The Common Lisp Cookbook, Diving into the Programmable programming language**. Oreilly Publications.

DISTRIBUTED SYSTEMS

Credits: 4 **Semester: III**
Course Code: CSAI22301 **No. of Lecture Hours: 60**

Course Objective. To enable students with the concepts of distributed environment, uses, replications and security issues.

Course Outcomes:

COl: To inculcate knowledge on Hardware requirement of distributed systems and communications.
CO2: To demonstrate the concepts of naming, synchronization issues and Consistency and replication.
CO3: To inculcate knowledge on Distributed Object based Systems, replication consistency,fault tolerance.
CO4: To illustrate the concepts of Distributed File Systems and Distributed Web-based Systems.
CO5: To illustrate the concepts of Distributed Coordination-Based Systems and Map-Reduce

UNIT-I	**12Hrs**
Introduction: Goals and Types of Distributed Systems	3
Architectures: Architectural Styles, System Architectures, Architectures versus Middleware, and Self-Management in Distributed Systems.	3
Processes: Threads, Virtualization, Clients, Servers, and Code Migration.	3
Communication: Fundamentals, Remote Procedure Call, Message-Oriented Communication, Stream-Oriented Communication, and Multicast Communication.	3
UNIT-II	**12Hrs**
Naming: Names, Identifiers and Addresses, Flat Naming, Structured Naming, and Attribute-Based Naming.	3
Synchronization: Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning of Nodes, and Election Algorithms.	3
Consistency and Replication: Introduction, Data-Centric Consistency Models,	3
Client-Centric Consistency Models, Replica Management, and Consistency Protocols.	3

UNIT-III	**12Hrs**
Fault Tolerance: Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server	3
Communication, Reliable Group Communication, Distributed Commit, and Recovery.	3
Distributed Object-Based Systems: Architecture, Processes,Communication, Naming, Synchronization,	3
Consistency and Replication, Fault Tolerance, and Security.	3
UNIT-IV	**12Hrs**
Distributed File Systems: Architecture, Processes, Communication, Naming, Synchronization,	3
Consistency and Replication, Fault Tolerance, and Security.	3
Distributed Web-Based Systems: Architecture, Processes, Communication, Naming, Synchronization,	3
Consistency and Replication, Fault Tolerance, and Security.	3
UNIT-V	**12Hrs**
Distributed Coordination-Based Systems: Introduction to Coordination Models, Architecture, Processes,	3
Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.	3
Map-Reduce: Example, Scaling, programming model, Apache Hadoop,	3
Amazon Elastic Map3Reduce,Mapreduce.net, Pig and Hive.	3

ESSENTIAL READING:

1. Andrew S. Tanenbaum and Maarten Van Steen, Distributed Systems, PHI 2nd Edition, 2009.
2. R. Hill, L. Hirsch, P. Lake, S. Moshiri, Guide to Cloud Computing, Principles and Practice‖, Springer, 2013.
3. R. Buyya, J. Borberg, A. Goscinski, Cloud Computing-Principles and Paradigms, Wiley, 2013.

DATABASE MANAGEMENT SYSTEMS

Credits:4 **Semester:III**
Course Code:CSAI22302 **No. of Lecture Hours:60**

Objectives:

- To design a database and enforce Integrity Constraints to keep database consistent.
- To normalize tables to eliminate redundancies.
- To query relational data using Structured Query Language.
- To understand storage strategies for easy retrieval of data through index.
- To understand PL/SQL and transaction management.

Course Outcomes:

CO1: **Represent** logical database using Entity Relationship and Enhanced ER model.
CO2: **Formulate** database using relational algebra and organize relation using normalization.
CO3: **Design** SQL queries and implements PL/SQL.
CO4: **Classify** the storage and file structure, storage access, indexing and hashing techniques of the database.
CO5: **Explain** the concept of Transactions, recovery system and concurrency control.

UNIT-I	**12Hrs**
1. Introduction, data base applications and purpose	2
2. View of data, data base languages-DDL,DML	2
3. Data base architecture, users and administrators	2
4. Design process overview, Entity relational ship model, Constraints	2
5. ER diagrams, design issues, weak entity sets	2
6. Extended ER features	2
UNIT-II	**12Hrs**
1. Structure of Relational model, Reduction to schema	1
2. Relational algebra- union, project, select and other operations	3
3. SQL- data definition, structure, set operations, Aggregate functions	2
4. Modification of data base, Nested sub queries, views, Joins and Null values	3
5. Introduction to Normalization, 1NF, 2NF and 3NF, BCNF	3
UNIT-III	**12Hrs**
1. Introduction, Programming, Functions and Procedures	2
2. Triggers, Cursors-implicit, explicit, cursor for loops	3
3. Roles, Authorization on views, functions and procedures	2
4. Application security	2
UNIT-IV	**12Hrs**
1. Overview of physical storage media	1
2. Magnetic disks- physical characteristics and performance measures	1
3. Buffer manager, replacement policies, File organization	3
4. Organization of records in files	2
5. Ordered indices, Index sequential-B+ trees	2
6. Static hash function, Dynamic hash function, comparison	3

UNIT-V **12Hrs**

1. Transactions- concepts, states 1
2. Implementation of Atomicity and durability, Concurrent executions 1
3. Serializability, Recoverability, Testing for Serializability 2
4. Concurrency control, lock based protocols, locks and granting locks 1
5. Two Phase locking and dead lock handling 2
6. Recovery system, failure 1
7. Storage structure- storage types, data access 2
8. Recovery and Atomicity, log based recovery, Check points 2

ESSENTIAL READING

1. Korth Henry, F. SilberSchatzAvi. And Sudarshan, S. 2013. **Database System Concepts. 6**th Edition. New Delhi: Tata McGraw-Hill.
2. Bayross Ivan. 2010. **SQL,PL/SQL- The Programming Language for Oracle**. 4th Edition. New Delhi: BPB Publications.

SUGGESTED READING

1. McFadden Fred, R. Hoffer Jeffery, A and Prescott Mary, B. 2007. **Modern Database Management**. 8th Edition. New Delhi: Pearson.
2. ElmasriRamez, Navathe and Shamkant , B. 2008. **Fundamentals of Database Systems**. 5th Edition. New Delhi: Pearson Education.

PYTHON PROGRAMMING

Credits: 4 **Semester: III**
Course Code: CSAI22303 **No. of Lecture Hrs: 75**
Objectives:

- To help the students understand the fundamentals of object-oriented programming.
- To emphasize on learning important principles of software development and provide practice in developing small-scale programs.

Outcomes:
CO1: **Explain**the basics of Python Programming constructs.
CO2: **Sub divides** larger problems into smaller ones using functions
CO3: Apply various data structures problem-solving
CO4: **Construct** Python programs as a set of objects.
CO5: **Select** an appropriate exception handling depending on application and design file operations and concurrent programming using Python standard library

UNIT – I **15Hrs**

1.	**Basics of Python Programming:** Features, History and future of Python, writing and executing first python program, Flavors of Python, Python Virtual machine, Memory management, Garbage collection, comparison among C, Python and Java	3
2.	Literal constants-Numbers, strings, Variables and Identifiers, Data types, Input Operation and Print Output, comments, Reserved words	2
3.	Operators and Expressions in Python, Other Data types-Tuples, dictionary, list. Type conversion, type() and Is Operator	3
4.	Decision control statements- if statement, if-else statements, Nested if ,if-elif-else	3
5.	Basic Loop structure- while loop, for loop, selecting an appropriate loop, Nested loops, Break statement, continue statement, pass statement, else statement used with loops	4

UNIT- II **15Hrs**

1.	**Functions and modules**-Need for functions, function definition, function call, variable scope and life time, Return statement, function definition using required argument, keyword argument, Default argument	4
2.	Lambda functions, Recursive functions	3
3.	Modules—The from…import statement, Name of module, making your own module	3
4.	The dir( ), the Python module, modules and Namespaces	2
5.	Packages in Python, Standard Library modules, Function redefinition	3

UNIT- III **15Hrs**

1.	**Python String: Introduction—**concatenating, Appending, multiplying strings, Strings are Immutable, string formatting operator	2
2.	Built-in String methods and functions, slice operation	2

3.	Ord( ) and chr( ) functions, in and not in operators, comparing and iterating strings	2
4.	The String module	2
5.	**Data Structures**: Sequence, Lists, Functional programming: filter(),map() andreduce()function, Tuple, sets	4
6.	Dictionaries—creating dictionary, adding, modifying,sorting and deleting item in dictionary, looping and nested dictionary, built-in dictionary functions,difference between list and dictionaries	3

UNIT- IV **15 Hrs**

1	**Classes and objects-**Introduction, defining classes, creating objects, data abstraction	2
2.	Class method and self argument, The __init__() method, class variables and object variables, The __del__() method, other special methods, public and private data members, private methods	3
3.	Calling a class method from another class method, built-in functions to check, Get, Set and Delete Class Attribute, Built-in class attribute	3
4.	**Inheritance :**Introduction, inheriting classes in Python, Types of Inheritance	3
5.	Composition or containership or complex objects, abstract classes and interfaces Meta class	2
6.	**Operator overloading**—Introduction, Implementing operator overloading, reverseAdding	2

UNIT- V **15 Hrs**

1.	**Error and Exception Handling**- Introduction to errors and exceptions, handling exceptions	1
2.	Multiple except blocks, multiple exceptions in a single block, except block without exception	1
3.	Raising Exceptions, Instantiating exceptions, handling exceptions in invoked functions, Built-in and user defined exceptions, the finally block	2
4.	**File Handling-**Introduction, File path, Types of Files-ASCII text file ,Binary file, opening and closing files	2
5.	**Reading and writing files-**write(), writelines(),append(),readline()	1
6.	File positions, renaming and deleting files, Directory methods	2
7.	**Threads:** single-tasking, multitasking, difference between process and thread, concurrent programming and GIL, uses of thread	2
8.	Create threads in Python, thread class methods, single and multitasking using threads, thread synchronization, deadlock of threads, thread communication.	4

ESSENTIAL READING

1. Thareja, Reema. 2017. **Python Programming**. 3rd Edition. New Delhi: Oxford HED
2. Dr. R. NageshwaraRao. 2018. **Core Python Programming**. 2nd Edition. DreamTech Press

SUGGESTED READING

1. BalaGuruSwamy, E. 2017. **Problem Solving and Python Programming**. 1st Edition. McGraw Hill Education
2. Gowrishankar S, Veena A. 2019. **Introduction to Python Programming.** CRC Press, Taylor & Francis Group

ARTIFICIAL INTELLIGENCE

Credits : 4 **Semester: III**
Course Code : CSAI22304 **No. of Lecture Hours: 60Hrs**

Objective: To familiarize with basic principles of AI and learn various applications of AI.

Course outcomes:
CO1: Explain types and AI applications.
CO2: Apply search algorithms to solve AI problems
CO3: Infer first order logic to represent knowledge
CO4: Explain various reasoning in AI
CO5: Develop AI problems using prolog.

UNIT-I	**12Hrs**
1. Introduction, History, typesand applications of AI	2
2. Intelligent Agent-types of agents, Intelligent agent, Agent Environment	2
3. Turing Test in AI	1
PROBLEM SOLVING THROUGH AI	
4. Introduction, representation of AI problems	2
5. Production system, Algorithm of Problem solving	1
6. Examples of AI problems-Water Jug Problem, Magic Square,TSP	2
7. Missionaries and Cannibals problem, Towers of Hanoi, Nature of AI problems	2

UNIT-II	**12Hrs**
1. Search Algorithms, Uninformed Search Algorithms	4
2. Informed search algorithms-Best-first search, A*, AO* Algorithm	3
3. Constraint satisfaction, Means Ends Analysis	3
4. Min-Max search and alpha-beta pruning	2

UNIT-III	**12Hrs**
1. Knowledge based agent, knowledge representation-types of knowledge	2
2. Knowledge representation techniques, Propositional logic	2
3. Rules of inference, Wumpus world- Knowledge base	3
4. First order logic, Inference in FOL, Unification and resolution in FOL	3

UNIT-IV	**12Hrs**
1. Forward and backward chaining, Forward vs Backward chaining	2
2. Reasoning in AI, Inductive vs Deductive reasoning	3
3. Probabilistic reasoning in AI, Bayes theorem and Bayesian Belief network	4
PLANNING	
4. Planning-components, block world planning, identifying solution, Goal stack Planning	3

UNIT-V **12Hrs**

1. Introduction to Prolog, Basics, Relations, Prolog Syntax, data objects 3
2. Types of Prolog, Operators, Loop and Decision Making 3
3. Conjunctions and disjunctions, Lists, recursion and structures 3
4. Backtracking, Inputs and outputs, different and not, clauses and predicates 3

ESSENTIAL READING

1. Kumar, Ela. 2019. **Artificial Intelligence**. 1st Edition. I.K International Publishing House Pvt. Ltd. India: New Delhi
2. RusselJ,Stuart. Norvig, Peter. 2015. **Artificial Intelligence, A Modern Approach**. 3rd Edition. Pearson Education. New Delhi: India.

SUGGESTED READING

1. Kaushik, Saroj**.** 2019. **Artificial Intelligence.** First Edition. CENGAGE LEARNING. India: New Delhi
2. Rich, Eliane. , Knight, Kevin, Nair. Shiv Shanker. 2008. **Artificial Intelligence**. 3rd Edition. TMH. India: New Delhi

LISP PROGRAMMING LAB

Credits: 1 **Semester: III**
Course Code: G22CSAI1P **No. of Practical Hrs: 30**

Objective: To understand the programming concepts and constructs of LISP.

1. LISP program to print Hello World
2. LISP Program that demonstrates operators using standard I/O functions (Arithmetic, logical, relational, etc)
3. LISP Program to check whether two numbers are equal.
4. LISP program to find the day of a given number using case.
5. LISP Program to print numbers in a range
6. LISP program to print even numbers in given list
7. LISP Program to check conditions with operators
8. LISP Program to iterate each number from range and perform increment and decrement operations.
9. LISP Program to get the particular number when the number is given.
10. LISP Program to perform an arithmetic operation when a particular key is chosen.
11. LISP program to find greatest or lowest of two numbers
12. LISP program to implement macro
13. LISP Program to print cubes of first 20 numbers
14. LISP program that demonstrates string case sensitive functions
15. LISP program that demonstrates case insensitive functions
16. LISP program to display the sum of each number.
17. LISP Program to find the square of each element by iteration.
18. LISP Program to implement predicates
19. LISP Program to demonstrate on functions
20. LISP program to find average of given numbers using functions
21. LISP program to sort array
22. LISP program to find the length of list recursively
23. LISP program to find GCD of two numbers
24. LISP program to find factorial of a number
25. LISP Program to count the number of elements in a list
26. LISP Program to find double, cube, square and triple of a number
27. Define a LISP function to compute sum of squares
28. LISP function to compute differance of squares .(if x > y return x2– y2 , Otherwise y2 – x2
29. Write a recursive LISP function which takes one argument as a list and return last element of The list.
30. LISP program to find area of circle using function
31. LISP program to find volume of a given box.
32. LISP program to find multiplication table.
33. LISP program on sequences, packages, and error handling
34. LISP program on data structures
35. LISP program on files and structures.

DATABASE MANAGEMENT SYSTEMS LAB

Credits:1 **Semester:III**

Course Code:CSAI22305No. of practical hours: 30

Objectives:

- To present the concepts and techniques relating to query processing by SQL engines.
- To present SQL and procedural interfaces to SQL comprehensively.

Outcome: Students will be able to use a commercial relational database system (Oracle) by writing Queries using SQL and implementing PL/SQL.

1. Create a database having two tables with the specified fields, to computerize a library system of a University College.

   LibraryBooks (Accession number, Title, Author, Department, PurchaseDate, Price),
   IssuedBooks (Accession number, Borrower)

   a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
   b) Delete the record of book titled “Database System Concepts”.
   c) Change the Department of the book titled “Discrete Maths” to “CS”.
   d) List all books that belong to “CS” department.
   e) List all books that belong to “CS” department and are written by author “Navathe”.
   f) List all computer (Department=”CS”) that have been issued.
   g) List all books which have a price less than 500 or purchased between “01/01/1999” and “01/01/2004”

2. Create a database having three tables to store the details of students of Computer Department in your college. Personal information about

   Student (College roll number, Name of student, Date of birth, Address, Marks(rounded off to the whole number) in percentage at 10 + 2, Phone number)
   Paper Details (Paper code, Name of the Paper)
   Student’s Academic and Attendance details (College roll number, Paper Code, Attendance, Marks in-home examination).

   a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
   b) Design a query that will return the records (from the second table) along with the name of student from the first table, related to students who have more than 75% attendance and more than 60% marks in paper2.
   c) List all students who live in “Warangal” and have marks greater than 60 in paper1.
   d) Find the total attendance and total marks obtained by each student.
   e) List the name of student who has got the highest marks in paper2.

3. Create the following tables and answer the queries given below:
   Customer (CustID, email, Name, Phone, ReferrerID)
   Bicycle (BicycleID, DatePurchased, Color, CustID, ModelNo)
   BicycleModel(ModelNo, Manufacturer, Style)
   Service (StartDate, BicycleID, EndDate)
   a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
   b) List all the customers who have the bicycles manufactured by manufacturer "Honda".
   c) List the bicycles purchased by the customers who have been referred by Customer "C1". d) List the manufacturer of red colored bicycles.
   e) List the models of the bicycles given for service.

4. Create the following tables, enter at least 5 records in each table and answer the queries given below.
   Employee (Person_Name, Street, City)
   Works (Person_Name, Company_Name, Salary)
   Company (Company_Name, City)
   Manages (Person_Name, Manager_Name)
   a) Identify primary and foreign keys.
   b) Alter table employee, add a column "email" of type varchar(20).
   c) Find the name of all managers who work for both Samba Bank and NCB Bank.
   d) Find the names, street address and cities of residence and salary of all employees who work for "Samba Bank" and earn more than $10,000.
   e) Find the names of all employees who live in the same city as the company for which they work.
   f) Find the highest salary, lowest salary and average salary paid by each company.
   g) Find the sum of salary and number of employees in each company.
   h) Find the name of the company that pays highest salary.

5. Create the following tables, enter at least 5 records in each table and answer the queries given below.
   Suppliers (SNo, Sname, Status, SCity)
   Parts (PNo, Pname, Colour, Weight, City)
   Project (JNo, Jname,Jcity)
   Shipment (Sno, Pno, Jno, Qunatity)
   a) Identify primary and foreign keys.
   b) Get supplier numbers for suppliers in Paris with status>20.
   c) Get suppliers details for suppliers who supply part P2. Display the supplier list in increasing order of supplier numbers.
   d) Get suppliers names for suppliers who do not supply part P2.
   e) For each shipment get full shipment details, including total shipment weights.
   f) Get all the shipments where the quantity is in the range 300 to 750 inclusive.
   g) Get part nos. for parts that either weigh more than 16 pounds or are supplied by suppliers S2, or both.

h) Get the names of cities that store more than five red parts.
i) Get full details of parts supplied by a supplier in Hyderabad.
j) Get part numbers for part supplied by a supplier in Warangal to a project in Chennai.
k) Get the total number of project supplied by a supplier (say, S1).
l) Get the total quantity of a part (say, P1) supplied by a supplier (say, S1).

6. Create a Supplier table as shown below
   a) Supplier(Sup_No,Sup_Name,Item_Supplied,Item_Price,City)

Sup_No (Primary Key)	Sup_Name	Item_Supplied	Item_Price	City
S1	Suresh	Keyboard	400	Hyderabad
S2	Kiran	Processor	8000	Delhi
S3	Mohan	Mouse	350	Delhi
S4	Ramesh	Processor	9000	Bangalore
S5	Manish	Printer	6000	Mumbai
S6	Srikanth	Processor	8500	Chennai

   a. Create table and insert atleast 6 rows.
   b. Display Supplier numbers and Supplier names beginning with 'R'
   c. Find the names of the suppliers who supply Processors and city is Delhi
   d. Increase the price of the keyboard by 200.
   e. Display the names of suppliers who supply the same items as supplied by Ramesh.
   f. Display supplier numbers, Supplier names and Item_Price for suppliers in Delhi in the ascending order of itemprice.
   g. Write sql query to add a new column called CONTACTNO.
   h. Delete the record whose itemprice is the lowest of all the items supplied .
   i. Display records in the descending order of itemprice for each itemsupplied.
   j. Display the records of suppliers who supply items other than Processor or Keyboard.

7. a) Emp(Eid,Ename,DOB,Designation,Salary,DOJ)

Eid (Primary Key)	Ename	DOB	Designation	Salary	DOJ
E101	Suma	29-Dec-89	Designer	20000	01-Apr-10
E102	Amit	10-Jan-95	Programmer	25000	18-Feb-18
E103	Payal	15-Aug-85	Tester	35000	13-Jun-11
E104	Kiran	20-Apr-90	Programmer	40000	7-Mar-14
E105	Meenal	29-May-83	DBA	50000	9-Dec-11
E106	Sheila	1-May-70	Analyst	60000	25-Sep-18
E107	Swamy	13-Jan-85	Programmer	45000	14-Feb-16
E108	Sushma	22-Dec-76	DBA	45000	31-Jan-12

a. create table and insert the rows
b. Write sql query to display all the employees whose designation is Programmer.
c. Write sql query to display employees who have joined after 2014
d. Display the total salary of all the employees whose designation is programmer.
e. Write sql query to display all the employee names in upper case.
f. Write sql query to display the details of the employees whose name contains'ee'.
g. Write sql query to increase the salaries of employees by 5000 whose designation is DBA
h. Write sql query to display all the employees whose name ends with 'a'.
i. Write sql query to display second highest salary
j. Write sql query to display minimum salary of a programmer.
k. Write sql query to display the fields Eid, Ename and Dname.
l. Display all the employees who earn more than average salary of all the employees in the company.
m. Write sql query to list all the job designations in the employee table without repetitions

8. a) Emp(Eid, Ename,Deptid,Designation,salary,DOJ)
   b) Dept(Deptid,Dname)

Eid (Primary Key)	Ename	DeptId (Foreign Key)	Designation	Salary (> 10000)	DOJ
101	Sudha	D2	Clerk	20000	01-Apr-10
102	David	D1	Manager	50000	18-Feb-18
103	Preethi	D3	Clerk	35000	13-Jun-11
104	Kiran	D1	Salesman	20000	7-Mar-14
105	Meenal	D2	Clerk	50000	9-Dec-11
106	Sunitha	D3	Manager	60000	25-Sep-18
107	Akhil	D3	Clerk	25000	14-Feb-16
108	Sushma	D2	Manager	45000	31-Jan-12

DeptId (Primary Key)	Dname
D1	Sales
D2	Marketing
D3	Finance

a. create the table and insert the data
b. Write sql query to display all the clerks in DeptId D2.
c. Write sql query to display all the employees who joined in the year 2011.
d. Write sql query to display all the employees whose salary is between 30000 and 45000.
e. Writequery to sort the employee table in the descending order of salaries.
f. Write sql query to display all the employees who joined in the month of February.
g. Write query to display all the employee details Department wise and in the ascending order of their salaries.

9. a) Student(Sid, Sname, DOB,State,Gender,Category,Course)

Sid (Primary Key)	Sname	DOB	State	Gender	Category	Course
1001	Neha	29-Dec-02	Telangana	F	Gen	Comp
1002	Arun	10-Jan-02	Telangana	M	OBC	Honors
1003	Payal	15-Aug-01	Maharashtra	F	Gen	Appl
1004	Amrita	20-Apr-02	Karnataka	F	OBC	Honors
1005	Pavan	29-May-03	AndhraPradesh	M	ExServicemen	Comp
1006	Anchal	1-May-03	Gujarat	F	OBC	Comp
1007	Ramya	13-Jan-02	Telangana	F	Gen	Appl
1008	Rakesh	22-Dec-01	AndhraPradesh	M	Sports	Comp

a. Create table and insert rows
b. Write sql query to display the students who are not from Telangana or AndhraPradesh
c. Create a view to display the columns Sid, Sname for students belonging to Telangana

d. Display all the female students enrolled under Comp course and who belong to OBC
e. Write sql query to display the student ids, names, and their present age
f. Display the students in the ascending order of their names for each course
g. Delete all the students records who have enrolled for Comp course and who are born after 2002.
h. Write a sql query to add two new columns Contactno and Email to the existing fields.
i. Write a sql query to display all the Student names where the length of the name is 5 characters.
j. Count the number of students in each course.

10. a) Library(Bookid,BookName,Author,DatePurchased,Publisher,Price)

BookId (Primary Key)	BookName	Author	DatePurchased	Publisher	Price
B101	Cost Accounting	Jain Narang	11-Feb-13	Kalyani	800
B102	Business Statistics	OP Aggarwal	22-Dec-11	Himalaya	750
B103	Rdbms	C J Date	2-Mar-15	TMH	900
B104	Mgmt Accounting	RK Sharma	19-Apr-16	Kalyani	450
B105	Operating Systems	Galvin	25-Nov-13	PHI	750
B106	Advanced Accounting	SC Gupta	16-Apr-18	Himalaya	600

a. Create table and insert rows
b. Display the list of authors from Himalaya publications
c. Display the total cost of books purchased Publisher wise
d. Rename the column Publisher as Publications
e. Count the total number of books under Kalyani publications

f. Display the books whose price is between 500 and 700
g. Increase the price of all the books by 200 except for Himalaya or Kalyani publisher
h. Display the book details where author name contains the name Sharma.
i. Create a view to display the fields BookId and BookNameof Himalaya publisher
j. Display the books in the ascending order of DatePurchased.

PL/SQL Programming

11. PL/SQL program to implement operators using case structure
12. PL/SQL program to print numbers from 1 to 10 using loop structures
13. PL/SQL program to check whether a number is Armstrong or not
14. PL/SQL program to reverse a string and check for palindrome
15. PL/SQL to find area of circle each with radius from 3 to 5. Store the result in a table.
16. PL/SQL program to swap numbers using procedures
17. PL/SQL program to raise user defined exception.
18. PL/SQL program to demonstrate triggers
19. PL/SQL program to print multiplication table of a number
20. PL/SQL program to print names of employees beginning with S using cursor
21. PL/SQL program to find sum of salaries in each department.
22. PL/SQL program to find largest of three number
23. PL/SQL program to check whether a number is prime or not using procedures.
24. PL/SQL program to find factorial of a number using functions.
25. PL/SQL program to check whether a number is even or odd
26. PL/SQL Program to print square,cube and double of a number.

PYTHON PROGRAMMING LAB

Credits : 1 **Semester: III**
Course Code :CSAI22306 **No. of Practical Hours: 30**

Objectives:

To strengthen problem-solving ability by applying the characteristics of an object-oriented approach in Python.

Outcome: Students will be able to develop applications using object-oriented concepts of varying complexities.

1. Write a program that takes two integers as command line arguments and prints the sum of two integers.
2. Program to display the information: Your name, Full Address, Mobile Number, College Name, Course Subjects
3. Program to find the largest number among ‘n’ given numbers.
4. Program to find the sum of all prime numbers between 1 and 1000.
5. Program that reads set of integers and displays first and second largest numbers.
6. program to check whether the character is digit or alphabet or space.
7. Program to sum of series 1+1/2+1/3+……+1/n
8. Program to print the sum of first ‘n’ natural numbers.
9. Program to perform operations on two matrices such as add, product and transpose
10. Program to find the roots of a quadratic equation
11. Write both recursive and non-recursive functions for the following:
    a. To find GCD of two integers
    b. To find the factorial of positive integer
    c. To print Fibonacci Sequence up to given number ‘n’
    d. To convert decimal number to Binary equivalent
12. Program to print calendar of a month given start date and number of Days.
13. Program with a function that accepts two arguments: a list and a number ‘n’. It should display all the numbers in the list that are greater than the given number ‘n’.
14. Program with a function to find how many numbers are divisible by 2, 3,4,5,6 and 7 between 1 to 1000
15. Program that accept a string as an argument and return the number of vowels and consonants the string contains.
16. Program that accepts two strings S1, S2, and finds whether they are equal are not.
17. Program to count the number of occurrences of characters in a given string.
18. Program to find whether a given string is palindrome or not
19. Program with a function that takes two lists L1 and L2 containing integer numbers as parameters. The return value is a single list containing the pair wise sums of the numbers in L1 and L2.

20. Program to read the lists of numbers as L1, print the lists in reverse order without using reverse function.
21. Program for functional programming – map, reduce, filter.
22. Write a program that combine lists L1 and L2 into a dictionary.
23. Program to find mean, median, mode for the given set of numbers in a list.
24. Program to find all duplicates in the list.
25. Program to find all the unique elements of a list.
26. Program to find max and min of a given tuple of integers.
27. Program to find union, intersection, difference, symmetric difference of given two sets.
28. Program to display a list of all unique words in a text file
29. Program to copy contents of a file.
30. Program to count number of times a character appears in a file.
31. Program to read the content of a text file and display it on the screen line wise with a line number followed by a colon
32. Program to analyze the two text files using set operations
33. Write a program to print each line of a file in reverse order.
34. Program to create class rectangle to print area of the rectangle.
35. Program to implement the inheritance
36. Program to create class polygon and derive reangle and triangle class to find areas
37. Program to implement on threads
38. Program to demonstrate user defined exception
39. Program to implement the polymorphism
40. Program to overload + operator on complex object

ARTIFICIAL INTELLIGENCE-LAB

Credits : 1 **Semester: III**
Course Code : CSAI22307 **No. of Lecture Hours: 30**

Objective: To demonstrate problems in AI.

1. Program to demonstrate Water Jug problem.
2. Program to demonstrate Magic Square.
3. Program for Towers of Hanoi.
4. Program for Travelling Salesperson problem.
5. Program to implement uniformed search algorithms.
6. Program to find length of an input list.
7. Program to count presence of a token string in given input string.
8. Program to merge in one ordered list.
9. Program to find union of two sets.
10. Program to find whether a given set is sub set of another set.
11. Program to ignore space characters from input
12. Program to read a character and decide if its is digit or alphanumeric.
13. Program to find maximum in a list.
14. Program to convert decimal number to binary
15. Program to check whether a given year is leap or not
16. Program to find GCD and LCM of two numbers
17. Program to calculate factorial of a number
18. Program to find hypotenuse in a right angle triangle
19. Program to convert Fahrenheit to Celsius
20. Program to find Fibonacci sequence
21. Program to calculate roots of quadratic equation
22. Program for map coloring
23. Program for linked lists.
24. Program on monkey-banana problem
25. Program on backtracking.

YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
DEPARTMENT OF B.Sc COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE
FOURTH SEMESTER
ACADEMIC YEAR 2024-25 OF 2023-26 BATCH (CBCS)

Sl. No.	Part	Course Code	Title of the Course	Hours /Week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
1	I	CSAI22401	Operation Research(GE_3)	4	3	40	60	100	4
2	II	BS20409	Computer Networks (CORE-10)	4	3	40	60	100	4
3	II	CSAI22403	Machine Learning (CORE-11)	4	3	40	60	100	4
4	II	CSAI22404	Cloud Computing (CORE-12)	4	3	40	60	100	4
5	II	CSAI22405	Data Mining(CORE-13)	4	3	40	60	100	4
6	II	CSAI22406	Data Engineering Through Python (CORE-14)	5	3	40	60	100	4
PRACTICALS									
7	II	CSAI22407	Machine Learning Lab (CORE-11)	2	3	40	60	100	1
8	II	CSAI21408	Data Engineering Through Python lab(CORE- 14)	2	3	40	60	100	1
	Total			**29**	**-**	320	480	800	**26**

OPERATIONS RESEARCH

Credits:4 **Semester: IV**
Course Code : CSAI21401 **No. of Lecture hours:60**

Objective: To understand and analyze managerial problems in industry so that they are able to use resources (capitals, materials, staffing, and machines) more effectively.

Outcome:

CO1: Describe, contrast and compare differing structures for operating systems.
CO2: Understand and analyze theory and implementation of processes.
CO3: Understand what deadlock is and how it can occur when giving mutually exclusive access to multiple resources
CO4: Uunderstand the concepts of file system interface.
CO5: Define segmentation of Memory management in an Operating System.

UNIT-I	**12Hrs**
Operations research:	
Meaning and scope of operations research,Definition of general LPP	1
Formulation of Linear Programming Problem	3
Solution of linear programming problem by graphical method	3
Optimum solution of linear programming problem bysimplex Method.	5

UNIT-II	**12Hrs**
Concept of artificial variables.	2
Big M/Penalty method .	2
Two phase simplex methods.	2.
Concepts of duality of LPP.	1
Dual primal relationship.	5

UNIT-III	**12Hrs**
Definition of transportation problem	1
Transportation problem as a special case of LPP.	2
Initial basic feasible solution by North West corner rule, Matrix Minima and Vogel's Approximation Methods.	3
Optimal Solution through MODI method for balanced and unbalanced transportation problems.	4
Degeneracy in Transportation problem and resolving it.	2

UNIT-IV	**12Hrs**
Formulation and description of Assignment problem.	1
Assignment problem as a special case of T.P and L.P.P	1
Unbalanced Assignment problem,	1
Optimal solution using Hungarian Method	6
And travelling salesman problem and its solution.	3

UNIT-V	**12Hrs**
Problem of Sequencing	2
Optimal sequence of n jobs on two machines	5
and three machines without passing under appropriate conditions.	5

ESSENTIAL READING:

1. Sharma S.D. 2007.**OperationsResearch.**NewDelhi:S.Chand& Co.

SUGGESTED READING:

1. KantiSwarup,P.KGupta and Man Mohan. 2000.**OperationsResearch.**NewDelhi:S.Chand Company Ltd.

COMPUTER NETWORKS

Credits:4 **Semester:IV**
Coursecode:BS20409 **No. of lecture hours:60**

Objective:
To familiarize with fundamental concepts of computernetwork.
To gain expertise in various layers of the TCP/IPmodel.

Outcomes: Students will be able to
CO1: Understand and identify basic computer network topologies and protocols andexplain Data Communication Systemcomponents.
CO2: Describe the functions of each layer in OSI model and its protocols.
CO3: Classify different error detecting techniques.
CO4: Build skills of sub-netting and routing mechanisms.
CO5: Classify the routing protocols and analyze how to assign the IP addresses for the given network.
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UNIT-I

12Hrs

1. **Introduction**:DataCommunications, Networks, ProtocolsandStandards 2
2. OSI Model, Layers in OSI Model, TCP/IPProtocolSuite 2
3. Analog and Digital, Transmission Impairments 2
4. Transmission Media-Guided media, Connecting Devices (Hubs, Repeaters, Bridges, Routers-Only Definitions) 2
5. Digital Transmission-Digital-to-Digital Conversion 2
6. Multiplexing: Frequency-Division, Wavelength andTimeDivision 2

UNIT-II 12 Hrs

Data Link Layer:

1. Error Detection and Correction-Parity, Check Sum, CRC,Hamming Code 3
2. Data Link Control: Framing, Flow andErrorControl 2
3. Stop-and-Wait ARQ, Go-Back-N ARQ, SelectiveRepeat ARQ,Piggybacking 2
4. HDLC, Random Access- ALOHA, CSMA,CSMA/CD,CSMA/CA 3
5. WiredLANs-Ethernet 2

UNIT-III 12 Hrs

Network Layer:

1. IP addressSpace-Introduction 2
2. Classfuland Classless addressing, SubnettingandSupernetting 2
3. IPv4- datagram, Fragmentation, checksum, options 2

4. Internet Control Protocols- ICMP, IGMP, ARPandRARP 3
5. Delivery, Forwarding, Routing protocols-DistanceVectorRouting 3

UNIT-IV **12Hrs**

Transport Layer:

1. Process-to-Process Delivery, UDP-Well Known Ports, UserDatagram, Checksum 2
2. UDP Operation, useofUDP 2
3. TCP- process to process communication, Numbering bytes,TCPservices 2
4. Flow control- silly window syndrome,ErrorControl 3
5. TCP connection, State transition diagram, Congestion control,Timers,Options 3

UNIT-V **12 Hrs**

Application Layer:

1. DNS- Namespace, Domain Name Space, Distribution of Name Space 2
2. DNS in Internet, Resolution, DNS Messages, Types of Records 2
3. TELNET, E-mail Architecture, Message Transfer Agent: SMTP 3
4. Message Access Agent: POP, FTP 2
5. WWW and HTTP- architecture, web documents, HTTP 3

ESSENTIAL READING

1. Forouzan, BeharouzA. 2011. **Data Communications and Networking**. 3rdEdition. New Delhi: Tata McGrawHill. (UNIT- I andII)
2. Forouzan, BeharouzA. 2010. **TCP/IP Protocol Suite**. 3rdEdition. New Delhi: Tata McGrawHill. (UNIT-III,IV,V)

SUGGESTED READING

1. Tanenbaum, Andrew S. 2008. **Computer Networks**. 4th Edition. New Delhi: Pearson Education.

MACHINE LEARNING

Credits: 4 **Semester: IV**
Course Code: CSAI22403 **No. of Lecture Hrs: 60**

Objective: To understand the state of art machine learning algorithms
Course Outcomes
CO1: Illustrate various machine learning algorithms
CO2: Apply basic concepts of mathematics for machine learning
CO3: Examine various regression models for supervised learning
CO4: Choose appropriate classifier for performing classification.
CO5: Design model for clustering

UNIT-I	**12Hrs**
1. Machine learning: Introduction, applications, life cycle	2
2. AI vs Machine Learning	1
3. Types of data sets, sources for machine learning datasets	2
4. Data Pre-processing in Machine learning	2
5. Types of machine learning,Supervisedvs Un Supervised learning	2
6. Types of machine learning algorithms	2
7. Examples of machine learning	1

UNIT-II	**12Hrs**
1. Confusion matrix, Cross validation, Overfitting, Underfitting	2
2. Regularization, P-Value, Essential mathematics for machine learning	2
3. Types of encoding techniques, feature selection techniques	2
4. Pre-requisites for machine learning, bias and variance	2
5. Gradient descent, linear algebra for machine learning	2
6. Feature engineering, Epoch, Anomaly detection in ML	2

UNIT-III	**12Hrs**
SUPERVISED LEARNING	
1. Regression analysis in machine learning, types of regression	2
2. Linear regression	2
3. Simple and multiple linear regression	3
4. Backward elimination, polynomial regression	2
5. Logistic regression	2
6. Linear vs Logistic regression	1

UNIT-IV	**12Hrs**
CLASSIFICATION	
1. Introduction toclassification, classification algorithm	2
2. classification vs regression	1
3. K-NN algorithm, Support vector machine algorithm	2

4. Naïve Bayes classifier, linear discriminant analysis	3
5. Decision tree algorithm, Random Forest algorithm	4

UNIT-V	**12Hrs**
1. Principal component analysis	2
2. Clustering in machine learning	2
3. Hierarchical clustering, K-means clustering	4
4. Association Rule learning	2
5. Apriori algorithm in machine learning	2

Essential Readings:

1. DuttSaikat, Chandra Mouli Subramanian, Das Amit Kumar. 2019. **Machine Learning.** 1st Edition. Pearson India Education Pvt Ltd. India: New Delhi
2. Jose, Jeeva. 2020. **Introduction to Machine Learning Using Python**. 1st Edition. Khanna Book Publishing Co. Pvt Ld. India: New Delhi.
3. https://data-flair.training/blogs/machine-learning-datasets/

CLOUD COMPUTING

Credits:4 **Semester:VI**
SubjectCode:CSAI22404 **No. of Lecture Hours:60**

Objectives:

- To know what a distributed system is and to understand properties of distributedsystem.
- To implement basics, techniques and tools for CloudComputing.
- To understand any kind of heterogeneous resources over a network using openstandards.

Outcomes: Students will be able to
CO1: Understand distributed systems for cloud computing
CO2: Identify cloud servers, types and components
CO3: Analysecloud architectural information in the present generation of market
CO4: Compare types of clients in the cloud and virtualization
CO5: Examine virtual machines the market and usage

UNIT – I **12hrs**

Introduction to Distributed Systems:

1. Characterization of distributed systems: Introduction, Examples of Distributed Systems	2
2. Resource sharing and Web – WWW	1
3. Challenges	1
4. System Models: Architectural Models	2
5. Network and Internetworking: Types of Network	3
6. Networking Principles, Internet Protocols	3

UNIT–II **12hrs**

Introduction to CloudComputing:

1. Cloud Computing Overview - Introduction to Cloud Computing, Cloud Components, Infrastructure Services	2
2. Benefits – Scalability, Simplicity, Knowledgeable Vendors , More Internal Resources, Security	2
3. Limitations - Your Sensitive Information, Applications Not Ready, Developing Your Own Applications, Features ofCloudPlatform	3
4. System Models for Advanced Computing –Clusters of Cooperative Computing, Grid Computing andCloudComputing.	2
5. Software Systems for Advanced Computing-Service Oriented Software, Parallel and Distributed Programming Models withIntroductory Details	3

UNIT–III **12hrs**

Cloud Computing Architecture:

1. Introduction 1
2. The Cloud Reference Model: Architecture, Infrastructure and Hardware-as-a-service, Platform as a Service, Software asaService 3
3. Types of clouds: Public Clouds, Private Clouds, HybridClouds, Community Clouds 3
4. Economics oftheCloud 2
5. Open Challenges: Cloud Definition, Cloud Interoperability and Standards, Scalability and Fault Tolerance, Security, Trust and Privacy,Organizational Aspects 3

UNIT-IV **12hrs**

Cloud Computing Technology:

1. **Hardware and Infrastructure:** Clients, Mobile,Thin, Thick 2
2. **Local Clouds and Thin Clients:** Virtualization, How to Virtualize, Concern and Security 3
3. Virtualization and Cloud Computing 2
4. Pros and Cons of Virtualization2
5. Cloud security:Datasecurity,Access control, Auditing: internal and External audit, Authentication and Authorization 3

UNIT-V **12hrs**

1. **Virtualization:**Introduction and Characteristics of Virtualized Environments: Increased Security,Managed Execution, Portability 3
2. **Taxonomy of Virtualization Techniques:** Execution Virtualization, Other Types of Virtualization 3
3. **Cloud Storage:** Overview: The Basics, Storage as a Service, Providers,Security 3
4. **Virtualization types**: Microsoft Hyper-V, VMware, VMware Infrastructure 3

ESSENTIAL READING

1. CoulourisG, DollimoreJ and KindbergT. **Distributed Systems Concepts andDesign.** 4th Edition. Pearson Education.
2. Geoffrey C Fox, Kaittwangand DongrraElsevier, Jack J. 2012. **Distributed and Cloud Computing.**India.
3. Buyya, ChristianVecchiolaand S.TanuraiSelvi. 2012. **Mastering Cloud Computing.** India:TMH.

SUGGESTED READING

1. Mahajan, S and Shah, S. **Distributed Computing.** Oxford UniversityPress.
2. RittingHouse, John W. and Ramsome, James F. 2012. **Cloud Computing.** India**:** CRC Press.
3. Shroff, Gautam. 2012. **Enterprise Cloud Computing.** Cambridge UniversityPress.

DATA MINING

Credits: 4 **Semester: IV**
Course Code:CSAI22405 **No. of Lecture Hrs: 60**

Objectives:to apply data mining techniques on the data sets.

Course Outcomes: Students will be able to
CO1: Understand the concepts of data mining
CO2: Identify the various sampling methods in data streams
CO3: Identify the various algorithms used for mining data sets
CO4: Compare the types of analysis techniques
CO5: Examine the discriminate analysis

Unit-1 **12hrs**

Data Mining

1.	What is data mining	1
2.	Statistical limits on data mining	2
3.	Things useful to know	1
4.	Application of Near-Neighbour search	2
5.	Shingling of documents	1
6.	Similarity-Preserving summaries of sets	2
7.	Distance measures	1
8.	Methods of high degrees of similarity	2

Unit-2 **12hrs**

Mining Data Streams

1.	The Stream data model	1
2.	Sampling data in a stream	2
3.	Filtering streams	1
4.	Counting distinct elements in a stream	2
5.	Estimating moments	1
6.	Page Rank	1
7.	Efficient computation of page rank	2
8.	Topic-sensitive page rank	2

Unit-3 **12hrs**

Frequent Itemsets

1.	The Market-Basket Model	2
2.	Market Baskets and A-Priori Algorithm	2
3.	Counting frequent items in a stream	2
4.	Introduction to Clustering Techniques	1
5.	Hierarchical clustering	2
6.	K-means and K-medoids Algorithm	2
7.	AdaBoost algorithm	1

Unit-4 **12hrs**

Recommendation Systems

1.	Introduction to Recommendation system	1
2.	Model for Recommendation system	2
3.	Content-Based recommendation	2
4.	K-Fold cross validation	2
5.	Introduction Dimensionality Reduction	2
6.	Case study – Netflix challenge, LinkedIn data , Amazon data	3

Unit-5 **12hrs**

Dimensionality Reduction

1.	Dimensionality reduction techniques	2
2.	Eigen values and Eigen vectors	2
3.	Feature selection and feature extraction	2
4.	PCA	2
5.	LDA	2
6.	Random Forests and partial least squares regression	2

ESSENTIAL READING:

Jure LeskovecAnandRajaraman Jeffrey Dfavid Ullman **Mining Of Massive Data Sets**
Second edition 2014

SUGGESTED READING:

1.**Discovering Knowledge In Data**:An Introduction To Data Mining,2nd Edition By Daniel T Larose And Chantal D,John Wiley

DATA ENGINEERING THROUGH PYTHON

Credits: 4 **Semester: IV**
Course Code: CSAI22406 **No. of Lecture Hrs: 75**

Objectives: To handle data wrangling with Python.

Course Outcomes:
CO1: Explain data science concepts and working with files and text data.
CO2: Apply regular expressions on strings
CO3: Explain database operations using MySQL and working with NUMPY.
CO4: Select appropriate plot techniques for visualizing data
CO5: Formulate graph theory using python modules

UNIT-I	**15Hrs**
1. Introduction to Data Science, Data Analysis sequence, Data Acquisition Pipeline	3
Files and Working with Text Data	
2. Types of Files, Creating and Reading Text Data	3
3. File Methods to Read and Write Data, Reading and Writing Binary Files	3
4. The Pickle Module, Reading and Writing CSV Files	3
5. Python os and os.pathModules, JSON and XML in Python	3

UNIT-II	**15Hrs**
Working with Text Data	
1. Processing HTML Files, Processing Texts in Natural Languages	5
Regular Expression Operations	
2. Using Special Characters, Regular Expression Methods	5
3. Named Groups in Python Regular Expressions, Regular Expression with glob Module	5

UNIT-III	**15Hrs**
Working with Databases	
1. Setting Up a MySQL Database, Using a MySQL Database: Command Line	2
2. Using a MySQL Database, Taming Document Stores: MongoDB	3
Working with Tabular Numeric Data(Numpy with Python):	
3. NumPy Arrays Creation Using array() Function, Array Attributes,	2
4. NumPy Arrays Creation with Initial Placeholder Content, Integer Indexing,	2
5. Array Indexing, Boolean ArrayIndexing, Slicing and Iterating in Arrays,	2
6. Basic Arithmetic Operations on NumPy Arrays,	1
7. Mathematical Functions in NumPy, Broadcasting in Arrays.	2
8. Changing the Shape of an Array, Stacking and Splitting of Arrays,	1

UNIT-IV **15Hrs**

Working with Data Series and Frames

1. Pandas Data Structures, Reshaping Data, Handling Missing Data	3
2. Combining Data, Ordering and Describing Data	3
3. Transforming Data, Taming Pandas File I/O	3

Plotting

1. Basic Plotting with PyPlot, Getting to Know Other Plot Types	3
2. Mastering Embellishments, Plotting with Pandas	3

UNIT-V **15Hrs**

Working with Network Data

1. Dissecting graphs	3
2. Network Analysis sequence	3
3. Harnessing networks-Building and fixing a network Exploring and Analysing a network, Managing attributes, Input & Output	4

Probability and Statistics

4. Probability Distributions, statistical measures, Python modules for statistics	5

Essential Reading

1. Zinoriev, Dmitry. 2016. **Data Science Essentials in Python: Collect, Organize, Explore, Predict, Value**. **The Pragmatic Programmers LLC. USA**
2. GowriShankar S, Veena A. 2019. **Introduction to Python Programming**. CRC Press, Taylor & Francis Group.

MACHINE LEARNING-LAB

Credits: 1 **Semester: IV**
Course Code: CSAI22407 **No. of Practical Hrs:30**

Objective: To demonstrate machine learning algorithms on datasets.

1. Mall Customers Dataset
The Mall customers dataset contains information about people visiting the mall. The dataset has gender, customer id, age, annual income, and spending score. It collects insights from the data and group customers based on their behaviors.
1.1Data Link: mall customers dataset
1.2Data Science Project Idea: Segment the customers based on the age, gender, interest. Customer segmentation is an important practise of dividing customers base into individual groups that are similar. It is useful in customised marketing.

2.Iris Dataset
The iris dataset is a simple and beginner-friendly dataset that contains information about the flower petal and sepal sizes. The dataset has 3 classes with 50 instances in each class, therefore, it contains 150 rows with only 4 columns.
2.1Data Link: Iris dataset
2.2 Data Science Project Idea: Implement a machine learning classification or regression model on the dataset. Classification is the task of separating items into its corresponding class.
3.MNIST Dataset
This is a database of handwritten digits. It contains 60,000 training images and 10,000 testing images. This is a perfect dataset to start implementing image classification where you can classify a digit from 0 to 9.
3.1Data Link: MNIST dataset
3.2Data Science Project Idea: Implement a machine learning classification algorithm on image to recognize handwritten digits from a paper.
4.The Boston Housing Dataset
This is a popular dataset used in pattern recognition. It contains information about the different houses in Boston based on crime rate, tax, number of rooms, etc. It has 506 rows and 14 different variables in columns. You can use this dataset to predict house prices.
4.1 Data Link: Boston dataset
4.2 Data Science Project Idea: Predict the housing prices of a new house using linear regression. Linear regression is used to predict values of unknown input when the data has some linear relationship between input and output variables.

5. Fake News Detection Dataset
It is a CSV file that has 7796 rows with 4 columns. The first column identifies news, second for the title, third for news text and fourth is the label TRUE or FAKE.
5.1 Data Link: Fake news detection dataset

5.2 Data Science Project Idea: Build a fake news detection model with Passive Aggressive Classifier algorithm. The Passive Aggressive algorithm can classify massive streams of data, it can be implemented quickly.

6. Wine quality dataset

The dataset contains different chemical information about wine. It has 4898 instances with 14 variables each. The dataset is good for classification and regression tasks. The model can be used to predict wine quality.

6.1 Data Link: Wine quality dataset

6.2 Data Science Project Idea: Perform various different machine learning algorithms like regression, decision tree, random forests, etc and differentiate between the models and analyse their performances.

7. SOCR data – Heights and Weights Dataset

This is a simple dataset to start with. It contains only the height (inches) and weights (pounds) of 25,000 different humans of 18 years of age. This dataset can be used to build a model that can predict the heights or weights of a human.

7.1 Data Link: Heights & weights dataset

7.2 Data Science Project Idea: Build a predictive model for determining height or weight of a person. Implement a linear regression model that will be used for predicting height or weight.

8. Parkinson Dataset

Parkinson is a nervous system disorder that affects movement. The dataset contains 195 records of people with 23 different attributes which contain biomedical measurements. The data is used to separate healthy people from people with Parkinson's disease.

8.1 Data Link: Parkinson dataset

8.2 Data Science Project Idea: The model can be used to differentiate healthy people from people having Parkinson's disease. The algorithm that is useful for this purpose is XGboost which stands for extreme gradient boosting, it is based on decision trees.

8.3 Source Code: Machine Learning Project on Detecting Parkinson's Disease

9. Titanic Dataset

On 15 April 1912, the unsinkable Titanic ship sank and killed 1502 passengers out of 2224. The dataset contains information like name, age, sex, number of siblings aboard, etc of about 891 passengers in the training set and 418 passengers in the testing set.

9.1 Data Link: Titanic dataset

9.2 Data Science Project Idea: Build a fun model to predict whether a person would have survived on the Titanic or not. You can use linear regression for this purpose.

10. Uber Pickups Dataset

The dataset has information of about 4.5 million uber pickups in New York City from April 2014 to September 2014 and 14million more from January 2015 to June 2015. Users can perform data analysis and gather insights from the data.

10.1 Data Link: Uber pickups dataset

10.2 Data Science Project Idea: To analyze the data of the customer rides and visualize the data to find insights that can help improve business. Data analysis and visualization is an important part of data science. They are used to gather insights from the data and with visualization you can get quick information from the data.

11. Chars74k Dataset

The dataset contains images of character symbols used in the English and Kannada languages. It has 64 classes (0-9, A-Z, a-z), 7.7k characters from natural images, 3.4k hand-drawn characters, and 62k computer-synthesized fonts.

11.1 Data Link: Chars 74k dataset
11.2 Data Science Project Idea: Implement character recognition in natural languages. Character recognition is the process of automatically identifying characters from written papers or printed texts.
12. Credit Card Fraud Detection Dataset
The dataset contains transactions made by credit cards, they are labeled as fraudulent or genuine. This is important for companies that have transaction systems to build a model for detecting fraudulent activities.
12.1 Data Link: Credit card fraud detection dataset
12.2 Data Science Project Idea: Implement different algorithms like decision trees, logistic regression, and artificial neural networks to see which gives better accuracy. Compare the results of each algorithm and understand the behavior of models.
12.3 Source Code: Credit Card Fraud Detection Machine Learning Project
13 Chatbot Intents Dataset
The dataset is a JSON file that contains different tags like greetings, goodbye, hospital_search, pharmacy_search, etc. Each tag contains a list of patterns a user can ask and the responses a chatbot can respond according to that pattern. The dataset is good for understanding how chatbot data works.
13.1 Data Link: Intents JSON Dataset
13.2 Data Science Project Idea: Tweak and expand the data with your observations to build and understand the working of a chatbot in organizations. A chatbot requires you to understand Natural language processing concepts.

DATA ENGINEERING THROUGH PYTHON- LAB

Credits : 1 **Semester: IV**
Course Code: CSAI22408 **No. of Lecture Hrs: 30**

Objective: To put into practice the ETL (extract, transform, load) pipeline which will extract raw data, clean the data, perform transformations on data, load data and visualize the data.

1. Write programs to parse text files, CSV, HTML, XML and JSON documents and extract relevant data. After retrieving data check any anomalies in the data, missing values etc.
2. Write programs for reading and writing binary files
3. Write programs for searching, splitting, and replacing strings based on pattern matching using regular expressions
4. Design a relational database for a small application and populate the database. Using SQL do the CRUD (create, read, update and delete) operations.
5. Create a Python MongoDB client using the Python module pymongo. Using a collection object practice functions for inserting, searching, removing, updating, replacing, and aggregating documents, as well as for creating indexes
6. Write programs to create numpy arrays of different shapes and from different sources, reshape and slice arrays, add array indexes, and apply arithmetic, logic, and aggregation functions to some or all array elements
7. Write programs to use the pandas datastructures: Frames and series as storage containers and for a variety of data-wrangling operations, such as:
    - **a.** Single-level and hierarchical indexing
    - **b.** Handling missing data
    - **c.** Arithmetic and Boolean operations on entire columns and tables
8. Write programs for data visualization.
9. Write programs to handle Network data.
10. Write programs for probability distributes using statistics module.