ANDHRA KESARI UNIVERSITY

Programme: B.Sc. Honours in Artificial Intelligence (Major)

w.e.f. AY 2023-24

COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	I	1	Essentials and Applications of Mathematical, Physical and Chemical Sciences	3+2	4
		2	Advances in Mathematical, Physical and Chemical Sciences	3+2	4
	II	3	Python for Data Science	3	3
			Python for Data Science Lab	2	1
		4	Statistical Methods and Probability Distribution	3	3
			Statistical Data Analysis Using SPSS - I Lab	2	1
II	III	5	Document Oriented Database	3	3
			Document Oriented Database Lab	2	1
		6	Operating Systems	3	3
			Operating Systems Lab	2	1
		7	Introduction to OOP using JAVA	3	3
			Introduction to OOP using JAVA Lab	2	1
		8	Inferential Statistics	3	3
			Statistical Data Analysis Using SPSS - II Lab	2	1
	IV	9	Data Warehousing and Data Mining	3	3
			Data Warehousing and Data Mining Lab	2	1
		10	Machine Learning using Python	3	3
			Machine Learning using Python Lab	2	1
		11	Introduction to AI	3	3
			Introduction to AI Lab	2	1

SEMESTER-III

COURSE 5: DOCUMENT ORIENTED DATABASE

Theory Credits: 3 3 hrs/week

Course Objective:

- To educate student regarding databases and how to manage databases.
- To handle the large amount of data handling demands of business
- To implement a data store that provides high performance, high availability, and automatic scaling
- To Process an immense diversity of data that needs to be stored and processed.
- To make use of features and functionalities to work on NO SQL Data Base Mongo DB

COURSE OUTCOME NO	Upon successful completion of this course, students should have the knowledge and skills to: \	PROGRAM OUTCOM NO
CO1	Have knowledge about database and DBMS Architecture	PO5, PO7
CO2	Able to know No SQL databases, various features of Mongo DB, the installation procedure, and how to interact with MongoDB.	PO5, PO7
CO3	Able to work on Mongo DB's rich query language to support create,read, update, and delete (CRUD) operations.	PO5, PO7
CO4	Analyses the aggregation framework to perform aggregation operations.	PO5, PO7
CO5	Able to work on indexes, types of index, index properties, and the various indexing strategies to be considered. Indexes are used to improvethe performance of a query.	PO5, PO7

Unit –I

Overview of Database Management Systems:

Introduction ,Data and Information , Characteristics of the Database Approach - Self-Describing Nature of the a Database System , Insulation between Programs and Data, Data Abstraction , Support of Multiple Views of the data , Sharing of Data and multiuser Transaction Processing , Actors on the Scene - Database Administrators , Database Designers , End Users , System Analysts and Application Programmers , Advantages of using a DBMS - Controlling Redundancy ,Restricting unauthorized Access , Providing Persistent Storage for Program Objects and Data Structures, Permitting Inferencing and Actions Using Rules ,Providing Multiple User Interfaces , Representing Complex Relationships Among data , Enforcing Integrity Constraints , Providing Backup and Recovery ,Database System Concepts and Architecture , DBMS Architecture and Data Independence - The Three-Schema Architecture , Data Independence , Database Languages and Interfaces.

Unit – II

Mongo DB Features and Installation, The Need for No SQL Databases, What Are No SQL Databases?

CAP Theorem, BASE Approach, Types of NoSQL Databases, MongoDB Features, Document Database

MongoDB Is Schemaless MongoDB Uses BSON , Rich Query Language, Terms Used in MongoDB, Data Types in MongoDB, Working with Database Commands, Create Database, Drop Database.

Unit III

MongoDB CRUD Operations, Collections, Create a Collection, Create Capped Collections, Create Operations, Insert Documents, Read Operations, Query Documents, Update Operations, Update Documents, Delete Operations, Delete Documents, Working with Arrays.

Unit IV

Data Modelling and Aggregation, Data Models, Embedded Data Models, Normalized Data Models Data Model Relationship Between Documents, Data Model Using an Embedded Document, Data Model Using Document References.

Unit V

Indexes and Working with Indexes, Index Types, Index Properties, Indexing Strategies.

Text Book:

1. "Fundamentals of Database Systems" by R.Elmasri and S.Navathe
2. "Database System Concepts" by Abraham Silberschatz, Henry Korth, and S. Sudarshan, McGrawhill, 2010.
3. MongoDB Recipes: With Data Modeling and Query Building Strategies By Subhashini Chellappan, Dharanitharan Ganesan , Publisher : Apress

Reference Book:

1. "Database Management Systems" by Raghu Ramakrishnan, NcGrawhill,2002
2. "Prinicples of Database Systems" by J.D.Ullman
3. MongoDB Basics 1st ed. Edition , by Peter Membrey (Author) Publisher : Apress Web Resources

Web Links:

1. https://docs.mongodb.com/manual/tutorial/getting-started
2. https://www.tutorialspoint.com/mongodb/index.htm

Recommended Co – Curricular Activities:

A. Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

B. General

1. Group Discussion
2. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

1. Programming exercises,
2. Practical assignments and laboratory reports,
3. Observation of practical skills,
4. Individual and group project reports.
5. Efficient delivery using seminar presentations,
6. Viva voce interviews.
7. Computerized adaptive testing, literature surveys and evaluations,
8. Peers and self-assessment, outputs form individual and collaborative work.

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SEMESTER-III

COURSE 5: DOCUMENT ORIENTED DATABASE

Practical Credits: 1 2 hrs/week

Course Objective:

The objective of this course is to enable student to implement database related queries using MongoDB.

COURSE OUTCOME	UPON SUCCESSFUL COMPLETION OF THIS COURSE, STUDENTS SHOULD HAVE THE KNOWLEDGE AND SKILLS TO	PROGRAM OUTCOME NO
CO1	Installation of mongo db ,configuring, running mongo db	PO5, PO7
CO2	Implementation of crud operations	PO5, PO7
CO3	Implementing index methods, aggregation methods	PO5, PO7
CO4	To study and implement DDL, DML commands using MYSQL	PO5, PO7
CO5	Implementing MySQL Programmes using Control Structures and functions.	PO5, PO7

WEEK 1:

Installing configuring running of Mongo db

Week 2:

Working with data base commands in mongo db

Week 3:

Working with crud operations in mongo db

Week 4:

Implementing aggregation operations in mongo db

Week 5:

Implementing index operationsWeek 6:

Working with create, alter, drop, rename and Truncate tables using MYSQL

Week 7:

Working with insert, update, delete, select statements using MYSQL

Week 8:

Write an MYSQL Program to retrieve the data from two tables using joins.

Week 9:

Write a MYSQL program to retrieve and display the names of the top5 students with highest marks in a specified course.

Week 10:

Write an MYSQL Program to calculate the average marks of all students and display it along with their name.

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SEMESTER-III

COURSE 6: OPERATING SYSTEMS

Theory Credits: 3 3 hrs/week

Course Objectives

1. To understand the services provided by and the design of an operating system.
2. To understand what a process is and how processes are synchronized and scheduled.
3. To understand different approaches to memory management.
4. To understand the structure and commands in unix
5. Students should be able to understand shell programming

Course Outcomes:

COURSE OUTCOME NO	UPON SUCCESSFUL COMPLETION OF THIS COU SHOULD HAVE THE KNOWLEDGE AND SKILLS	PROGRAM OUTCOME
CO1	Analyse the services and functions of operating systems	**PO5,PO7**
Co2	Analyse the concepts of processes in operating system and illustration of the scheduling of processor for a given problem instance.	**PO5,PO7**
Co3	Analyse memory management techniques, concepts of virtual memory	**PO5,PO7**
Co4	To understand Introduction to Unix:- Architecture of Unix, Features of Unix , Unix Commands	**PO5,PO7**
Co5	To understand **Shell programming and** Simple shell program examples	**PO5,PO7**

UNIT – I

Operating System:

Introduction, Operating Systems Objectives and functions, Computer System Architecture, OS Structure, OS Operations. Evolution of Operating Systems ,types of operating system, Simple ,Batch, Multi programmed, time shared, Parallel, Distributed Systems, Real-Time Systems, Operating System services.

UNIT – II

Process and CPU Scheduling –

Process concepts The Process, Process State, Process Control Block, Process communication. Threads. Process Scheduling Scheduling Queues, Schedulers, Context Switch, Pre-emptive Scheduling, Dispatcher, Scheduling Criteria, Scheduling algorithms,Process Synchronization, The Critical section Problem, Semaphores, Classic Problems of Synchronization,

UNIT – III

Memory Management and Virtual Memory –

Logical & physical Address Space, Swapping, Contiguous Allocation, Paging-Structure of Page Table Segmentation, Segmentation with Paging,Virtual Memory, Demand Paging, Performance of Demanding Paging Page Replacement Page Replacement Algorithms, Allocation of Frames.

UNIT – IV

Introduction to Unix:- Architecture of Unix, Features of Unix , Unix Commands – PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip.

UNIT – V Shell programming:

Ordinary and environment variables. The profile. Read and read only commands. Command line arguments. exit and exit status of a command. Logical operators for conditional execution. The test command and its shortcut. The if, while, for and case control statements. The set and shift commands and handling positional parameters. The here (<<) document and trap command. Simple shell program examples.

TEXT BOOK:

"Operating System Concepts"-Silberschatz, Galvin, Gagne-–eight Edition-John Willey & Sons INC 1,2,3 units

Sumitabha Das., Unix Concepts and Applications., 4thEdition., Tata McGraw Hill(4,5) units

REFERENCES BOOKS:

1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, Wiley Student Edition.
2. Principles of Operating Systems by Naresh Chauhan, OXFORD University Press

Student Activity:

1. Load any new operating system into your computer.
2. Partition the memory in your system
3. Create a semaphore for process synchronization.

Recommended Co – Curricular Activities:

Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

B. General

1. Group Discussion
2. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

1. Programming exercises,
2. Practical assignments and laboratory reports,

3. Observation of practical skills,
4. Individual and group project reports.
5. Efficient delivery using seminar presentations,
6. Viva voce interviews.
7. Computerized adaptive testing, literature surveys and evaluations,
8. Peers and self-assessment, outputs form individual and collaborative work.

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SEMESTER-III

COURSE 6: OPERATING SYSTEMS

Practical Credits: 1 2 hrs/week

Course Objective:

This course enables students to develop OS scheduling logics and also to gain hands-on experience of UNIX OS..

COURSE OUTCOME NO	UPON SUCCESSFUL COMPLETION OF THIS COURSE, STUDENTS SHOULD HAVE THE KNOWLEDGE AND SKILLS TO:	PROGRAM OUTCOME NO
CO1	To implement CPU scheduling algorithms in c programming language	Po5,po7
CO2	To implement file/directory handling commands in Unix.	Po5,po7
CO3	To display list of currently logged users in Unix shell script	Po5,po7
CO4	To implement binary search using shell script	Po5,po7
CO5	To implement Fibonacci series using shell script	Po5,po7

LAB LIST

1. Write the program to implement CPU scheduling algorithm for first come first serve
2. Scheduling
3. Write the program to implement CPU scheduling algorithm for first come first serve
4. Scheduling
5. Write a program to implement CPU scheduling algorithm for shortest job first scheduling.
6. write a program to implement CPU scheduling algorithm for shortest job first scheduling.
7. Write a ‘C’ program to perform priority scheduling.
8. Write a ‘C’ program to perform priority scheduling.
9. Write a program to implement CPU scheduling for Round Robin Scheduling.
10. Execute various file/directory handling commands in UNIX.
11. Execute various file/directory handling commands in UNIX.
12. Write a Simple shell script for basic arithmetic and logical calculations.
13. Write a shell script to display list of users currently logged in.
14. Write a shell script to delete all the temporary files.
15. Write a shell script to search an element from an array using binary searching.
16. Write a shell script to determine whether a given number is a prime number or not
17. Write a shell script to print the first *n* Fibonacci numbers.
18. Execute various system administrative commands

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SEMESTER-III

COURSE 7: OBJECT ORIENTED PROGRAMMING

Theory Credits: 3 3 hrs/week

Course Objectives:

The Objective of the course is to assist the student in understanding the concepts of Object Oriented Programming using Java language.

Course Outcomes: At the end of this course the student is able to

CO1: Overview of java programming, history and its features**.(PO5,PO7)**

CO2: Understand fundamentals of programming such as variables, conditional and iterative execution, statements, etc**.(PO5,PO6,PO7)**

CO3: Understand the principles of arrays, inheritance, packages and multi-threading**.(PO5,PO6,PO7)**

CO4: Understand the Fundamental features of Managing Errors, Exceptions and Applet Programming**.(PO5,PO6,PO7)**

CO5: Understand the Files concept in java**.(PO5,PO6,PO7)**

UNIT -I

JAVA Evolution: History – Features, Overview of Java Language: Introduction - Simple Java program - Structure - Java tokens - Statements - Java virtual Machine.
Constants - Variables - Data types - Operators and expressions.

UNIT -II

Decision making and Branching: Simple If Statement, the IF…Else statement, The Else... If ladder, The Switch Statement, The? : Operator, Decision making and looping: The While statement, The do Statement - The for Statement - Jumps in loops - labelled loops - Classes, Objects and Methods. Arrays, Strings

UNIT -III

Vectors – Interfaces- Multiple Inheritance – Packages: Putting classes together –Threaded Programming - Thread life cycle, Multi threads, Deadlocks. Managing Errors and Exceptions, I/O Exceptions.

UNIT -IV

Applet Programming – advantages and disadvantages of Applets, Applet life cycle - Event Handling in Applet, Applet Parameters and Communications; Graphics programming: The Graphics class- Lines and rectangles-Circles and ellipses-Drawing arcs -Line graphs -Drawing Bar charts.

UNIT -V

Files: Introduction – concept of streams – Stream classes – Using stream – I/O classes – File class – creation of files – Reading / Writing characters/ Bytes.

Text Books:			
	Author	**Title**	**Publisher**
1	E. Balaguruswamy,	Programming with JAVA - A Primer, 2015	McGraw Hill Professional

Reference Text Books:			
	Author	**Title**	**Publisher**

1	Sachin Malhotra	Programming in Java	OXFORD University Press
2	John R. Hubbard	Programming with Java, Second Edition	Schaum's outline Series, TATA McGraw-Hill Company.
3	Deitel &Deitel.	Java TM: How to Program 2007	PHI
4	D.S Mallik	Java Programming: From Problem Analysis to Program Design	
5	P. Radha Krishna	Object Oriented Programming Through Java, 2008	Universities Press

Course Delivery method: Face-to-face / Blended

Course has focus on: Skill Development.

Recommended Co – Curricular Activities:

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

A. Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging).
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

B. General

1. Group Discussion
2. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports.
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerised adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work.

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SEMESTER-III

COURSE 7: OBJECT ORIENTED PROGRAMMING

Practical Credits: 1 2 hrs/week

Course Objective:

The Objective of this course is to apply programming skills in java.

Course Outcomes: At the end of this course the student is able to

CO1: Overview of java programming**. (PO5,PO7)**

CO2: Understand fundamentals of programming such as variables, conditional and iterative execution, statements, etc**. (PO5,PO7)**

CO3: Understand the principles of arrays, inheritance, packages and multi-threading**. (PO5,PO7)**

CO4: Understand the Fundamental features of Exceptions and Applet Programming**. (PO5,PO7)**

CO5: Understand the Files concept in java**. (PO5,PO7)**

LAB LIST

1. Write a java program to print Hello World.
2. Write a java program on Variables.
3. Write a java program to use various Data types.
4. Write a java program to implement main method inside and outside of a class.
5. Write a java program on Operators.
6. Write a java program on Looping.
7. Write a java program to display Fibonacci series.
8. Write a java program to find out the given number is palindrome or not.
9. Write a java program on single and Multi-dimensional array.
10. Write a java program on Strings.
11. Write a java program on interface.
12. Write java programs on various types of Inheritance.
13. Write java programs on Packages.
14. Write a java program on Multi-Threading.
15. Write java programs on various types Exceptions.
16. Write an Applet program to draw a Line, Rectangle, Circle, Ellipse, Arcs a.
17. Write an Applet program to draw Line graphs and Bar charts.
18. Write a java program to create a file.
19. Write a java program to perform read data from a file.
20. Write a java program to perform write data from a file.

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SEMESTER-III

COURSE 8: INFERENTIAL STATISTICS

Theory Credits: 3 3 hrs/week

Course Objective:

This course enables students to gain knowledge in sampling, hypothesis testing and non parametric methods.

Course Outcomes:

After going through this course, the students will get

CO1: a fundamental understanding of Parametric models for developing relevant inferences on associated parameters,

CO2: knowledge of point and interval estimation procedures and different methods of point estimation,

CO3: using Neyman Pearson Lemma and finding Uniformly Most Powerful Test,

CO4:various basic concepts on sampling distributions and large sample tests based on normal distribution,

CO5 : small sample tests based on chi-square, Student's and Snedecor's F distributions

Unit I

Theory of Estimation: Parameter, Statistic, Standard Error of the statistic, concept of bias and mean square error of an estimate, Criteria of good estimator - unbiasedness, consistency, efficiency, and sufficiency. Methods of estimation- Maximum Likelihood estimator(MLE) and Method of Moments(MME).Concepts of confidence interval and confidence coefficient, confidence intervals for the parameters of univariate normal,

Unit II

Testing of Hypothesis : Statistical hypotheses, critical region, size and power of a test, most powerful test, two types of errors. Neyman Pearson lemma(WITHOUT PROOF) and its applications, uniformly most powerful unbiased test . One and two tailed tests. Procedure for testing of hypothesis, Tests of significance of large samples - Single proportion and difference of proportions, single mean and difference of means.

Unit III

Exact Sampling distributions : Student's t-distribution, Chi-square distribution, Snedecor's Fdistribution – definitions, properties and applications. Tests of significance for small samples: Student's t-distribution - single mean, difference of means and paired t-test. Chi-square distribution-test for goodness of fit and independence of attributes.

Unit IV

F-distribution – definition, properties and applications – F-test for equality of two population variances. ANOVA one way and two-way classifications

Unit V

Non-parametric methods- definition, advantages and disadvantages. One sample test- Sign test, Run test, Wilcoxon-signed rank test. Two independent sample tests: Median test, Wilcoxon- Mann Whitney U - test, Kruskal Wallis test - Simple Problems Note: Without proofs of named theorems and more importance to applications.

TEXT BOOK:

S.C. Gupta, (2019), Seventh Edition, Fundamentals of Statistics, Mumbai: Himalaya Publishing House.

REFERENCE BOOKS

1. Sharma, J. K. (2013), Business statistics, New Delhi: Pearson Education

2. Levine, D.M., Berenson, M. L. & Stephan, D. (2012), Statistics for managers using Microsoft Excel, New Delhi: Prentice Hall India Pvt.

3. Aczel, A. D. &Sounderpandian, J. (2011), Complete Business Statistics, New Delhi: Tata McGraw Hill.

4. Anderson, D., Sweeney, D., Williams, T., Camm, J., & Cochran, J. (2013), Statistics for Business and Economics, New Delhi: Cengage Learning.

5. Davis, G., &Pecar, B. (2014), Business Statistics using Excel, New Delhi: Oxford University Press.

Websites of Interest:

http://onlinestatbook.com/rvls/index.html

Co-Curricular Activities in the class:

1. Pictionary
2. Case Studies on topics in field of statistics
3. Snap test and Open Book test
4. Architectural – To be build the procedures
5. Extempore – Random concept to students
6. Interactive Sessions
7. Teaching through real world examples

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SEMESTER-III

COURSE 8: INFERENTIAL STATISTICS

Practical Credits: 1 2 hrs/week

Course Objective:

This course enables students to gain hands-on practical experience of SPSS for analysing data by implementing sample tests, ANOVA and nonparametric tests..

Course Outcome:

Upon successful completion of this course, students should have the knowledge and skills to:

CO1: Apply the various statistical methods for real life problems PO2

CO2 Apply the SPSS techniques and give the interpretations. PO2

List of Practicals using SPSS

1. Large Sample Tests: Test of significance of (a) Single Mean (b) Difference of means

2. Large Sample Tests: Test of significance of (a) Single Proportion (b) Difference of Proportions

3. Small Sample Tests: t-Test for significance of (a) Single mean (b) Difference of means- samples are independent (c) Difference of means- samples are dependent

4. Chi square Test of (a) Independence 2x2 Cross tabulation, (b) Goodness of fit

5 Test for several means ANOVA (a) One-way (b) Two- way classification,

6 Non Parametric Tests (a) Mann Whitney U test, (b) Wilcoxon Signed ranks test, (c) Kruskal Wallis Test, (d) Friedman test Note: Training shall be in SPSS and derive the results. The SPSS output shall be exported to MS word for writing inference.

Reference Manual: Practical Manual -Prepared by the Department Faculty Members

Websites of Interest: http://www.statsci.org/datasets.html

Scheme of Valuation for Practical Paper (i) Continuous evaluation 10 Marks (ii) External Evaluation: 40 marks

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SEMESTER-IV

COURSE 9: DATA WAREHOUSING AND DATA MINING

Theory Credits: 3 3 hrs/week

OBJECTIVE:

The course should enable the students to learn principles of Data warehousing and data mining with its architecture and understand data preprocessing methods to perform classification and prediction of data. Technical knowledge is helpful to implement Data Mining principles and techniques for real time applications.

Course Outcomes :

CO. NO.	Upon successful completion of this course, students should have the knowledge and skills to	PO. No.
1	To understand the principles of Data warehousing and Data Mining.	PO1, PSO1, PSO2, PSO4
2	To be familiar with the Data warehouse architecture and its Implementation.	PO1, PSO1, PSO2, PSO4
3	To know the Architecture of a Data Mining system.	PO1, PSO1, PSO2, PSO4
4	To understand the various Data preprocessing Methods.	PO1, PO7, PSO1, PSO2, PSO4
5	To perform classification and prediction of data.	PO1, PO7, PSO1, PSO2, PSO4

UNIT I

Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

UNIT II

Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture Of A Typical Data Mining Systems- Classification Of Data Mining Systems.

Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

UNIT III

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Backpropagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT IV

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

UNIT V

Mining Object, Spatial, Multimedia, Text and Web Data:
Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.Text Book

1. Jiawei Han, Micheline Kamber and Jian Pei"Data Mining Concepts and Techniques", Third Edition, Elsevier, 2011.

Reference Books

1. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
2. K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
4. Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2007.

RECOMMENDED CO-CURRICULAR ACTIVITIES:

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

A. Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual andchallenging)
2. Student seminars (on topics of the syllabus and related aspects (individualactivity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups asteams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

B. General

1. Group Discussion
2. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports.
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work.

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SEMESTER-IV

COURSE 9: DATA WAREHOUSING AND DATA MINING

Practical Credits: 1 2 hrs/week

Course Objectives:

This course enables students to practically implement various data mining techniques.

Course Outcomes:

By the end of this course, students will be able to

CO1: implement data files conversions and can train, test data sets for an application. (PO5, PO7)

CO2: generate accurate models, and demonstrate data pre - processing. (PO5, PO7)

CO3: Demonstrate text mining and web mining techniques. (PO4, PO7)

LAB EXPERIMENTS:

- □ List applications for mining
- □ File format for data mining
- □ Conversion of various data files
- □ Training the given dataset for an application
- □ Testing the given dataset for an application
- □ Generating accurate models
- □ Data pre-processing – data filters
- □ Feature selection
- □ Web mining
- □ Text mining
- □ Design of fact & dimension tables
- □ Generating graphs for star schema

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SEMESTER-IV

COURSE 10: MACHINE LEARNING USING PYTHON

Theory Credits: 3 3 hrs/week

OBJECTIVES:

- To understand the basic concepts of machine learning.
- To understand and build supervised learning models.
- To understand and build unsupervised learning models.
- To evaluate the algorithms based on corresponding metrics identified

Course Outcomes :

At the end of this course, the students will be able to:

CO1: Explain the basic concepts of machine learning.

CO2 : Construct supervised learning models.

CO3 : Construct unsupervised learning algorithms.

CO4: Evaluate and compare different models

UNIT I INTRODUCTION TO MACHINE LEARNING

Review of Linear Algebra for machine learning; Introduction and motivation for machine learning; Examples of machine learning applications, Vapnik-Chervonenkis (VC) dimension, Probably Approximately Correct (PAC) learning, Hypothesis spaces, Inductive bias, Generalization, Bias variance trade-off.

UNIT II SUPERVISED LEARNING

Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Perceptron algorithm, Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random Forests

UNIT III ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING

Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization.

UNIT IV NEURAL NETWORKS

Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.

UNIT V DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS

Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, measuring classifier performance, assessing a single classification algorithm and comparing two classification algorithms – *t* test, McNemar's test, K-fold CV paired *t* test

TEXT BOOKS:

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
2. Stephen Marsland, "Machine Learning: An Algorithmic Perspective, "Second Edition", CRC Press, 2014.

REFERENCES

1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
2. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.
3. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", Second Edition, MIT Press, ~~2012~~, 2018.
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016
5. Sebastain Raschka, Vahid Mirjalili , "Python Machine Learning", Packt publishing 3rd Edition, 2019.

Recommended Co – Curricular Activities:

A. Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

B. General

1. Group Discussion
2. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

1. Programming exercises,
2. Practical assignments and laboratory reports,
3. Observation of practical skills,
4. Individual and group project reports.
5. Efficient delivery using seminar presentations,
6. Viva voce interviews.
7. Computerized adaptive testing, literature surveys and evaluations,
8. Peers and self-assessment, outputs form individual and collaborative work.

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SEMESTER-IV

COURSE 10: MACHINE LEARNING USING PYTHON

Practical Credits: 1 2 hrs/week

OBJECTIVES:

- To understand the basic concepts of machine learning.
- To understand and build supervised learning models.
- To understand and build unsupervised learning models.
- To evaluate the algorithms based on corresponding metrics identified

Course Outcomes :

At the end of this course, the students will be able to:

CO1: Explain the basic concepts of machine learning.

CO2 : Construct supervised learning models.

CO3 : Construct unsupervised learning algorithms.

CO4: Evaluate and compare different models

EXPERIMENT LIST:

1. Write a python program to import and export data using Pandas library functions.
2. Demonstrate various data pre-processing techniques for a given dataset
3. Implement Dimensionality reduction using Principle Component Analysis (PCA) method.
4. Write a Python program to demonstrate various Data Visualization Techniques.
5. Implement Simple and Multiple Linear Regression Models.
6. Develop Logistic Regression Model for a given dataset.
7. Develop Decision Tree Classification model for a given dataset and use it to classify a new sample.
8. Implement Naïve Bayes Classification in Python.
9. Build KNN Classification model for a given dataset.
10. Build Artificial Neural Network model with back propagation on a given dataset.
    a. Implement Random forest ensemble method on a given dataset.
    b. Implement Boosting ensemble method on a given dataset.
11. Write a python program to implement K-Means clustering Algorithm.

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SEMESTER-IV

COURSE 11: INTRODUCTION TO AI

Theory Credits: 3 3 hrs/week

Course Objective:

The objective of this course is to educate students in basic Artificial Intelligence concepts and provide insights of solving problems using AI. This course also aims to educate students in basics of practical natural language processing and robotics.

Course Outcomes:

COURSE OUTCOME NO	Upon successful completion of this course, students should have the knowledge and skills to:	**PROGRAM OUTCOME NO**
CO1	Understand the need of AI and Intelligent Agents.	PO5, PO7
CO_2	Understand knowledge based agents and prepositional logic.	PO5, PO7
CO_3	Gain knowledge about learning agents and decision trees.	PO5, PO7
CO_4	Gain knowledge about practical applications of NLP.	PO5, PO7
CO_5	Understand parts, tasks and architecture of Robotics.	PO5, PO7

UNIT – I:

Introduction to AI: What is AI? AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT-II:

Searching: Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A*, AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

UNIT-III:

Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Baye's probabilistic interferences and dempstershafer theory.

UNIT-IV

First order logic: Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

UNIT-V:

Expert systems:- Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, expert systems success factors, types of expert systems, knowledge engineering, scope of knowledge, difficulties in knowledge acquisition methods of machine learning, selecting an appropriate knowledge acquisition method, societal impacts reasoning in artificial intelligence, inference with rules, with frames: model based reasoning, case based reasoning, explanation & meta knowledge inference with uncertainty.

TEXT BOOKS

Stuart Russell, Peter Norvig: "Artificial Intelligence: A Modern Approach",2nd Edition, Pearson Education, 2007

REFERENCES

1. Artificial Neural Networks B. Yagna Narayana, PHI
2. Artificial Intelligence, 2nd Edition, E.Rich and K.Knight (TMH).
3. Artificial Intelligence and Expert Systems – Patterson PHI.
4. Expert Systems: Principles and Programming- Fourth Edn, Giarrantana/ Riley, Thomson.
5. PROLOG Programming for Artificial Intelligence. Ivan Bratka- Third Edition – Pearson Education.
6. Neural Networks Simon Haykin PHI

Web Resources:

https://www.javatpoint.com/artificial-intelligence-ai

https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_overview.html

https://www.academia.edu/32098490/Introduction_to_artificial_intelligence

Recommended Co – Curricular Activities:

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

A: Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

B: General

1. Group Discussion
2. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports.
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work.

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SEMESTER-IV

COURSE 11: INTRODUCTION TO AI

Practical Credits: 1 2 hrs/week

Course Objective:

The objective of this course is to enable students to analyse various AI related problems and develop a solution using Python programming language.

Course Outcomes:

COURSE OUTCOME NO	Upon successful completion of this course, students should have the knowledge and skills to:	**PROGRAM OUTCOME NO**
CO1	Develop various basic python programs.	PO5, PO7
CO_2	Analyse and develop solutions for various problems like water jug, Tic – Tack – Toe, etc.	PO5, PO7
CO_3	Develop programs using DFS, BFS, A* and hill climbing algorithms.	PO5, PO7
CO_4	Develop python programs for analysing given data set.	PO5, PO7
CO_5	Develop python programs for implementing Bayes Classification.	PO5, PO7

Lab List

1. A) Basic programs in python.
   B) Programs demonstrating list, Vector, Matrix and Array
2. Solving water – jug problem using Python.
3. Implementing DFS and BFS using Python.
4. Solve 8 – puzzle problem using A* algorithm.
5. Solve 8 – puzzle problem using hill climbing Algorithm.
6. Implement Tic – Tac – Toe game using Python.
7. Develop Python code for mini – max algorithm.
8. Develop Python code for Hangman game.
9. A) Develop Python code for removing punctuation marks from the given string.
   B) Develop Python code for sorting the sentence in alphabetical order.
10. A) Using Pylog programming, display first order logic.
    B) Using Pylog programming, display unification process.
11. A) Find mean and mode for given data set.
    B) Calculate variance and standard deviation for given data set.
12. A) Determining probability of a prime number appearing when a 20 sided die is rolled.
    B) Time series analysis to predict rain fall information base on record.
13. Predict the class of testing sample using Bayes Classification.

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ANDHRA KESARI UNIVERSITY-ONGOLE, PRAKASAM DISTRICT
Single Major Programme from the Year 2023-24 Onwards
Programme-B.Sc. Honours Artificial Intelligence -Question Paper model,
Second Year-Semester-III & IV

Time: 3 Hours Total Marks: 75

PART –A

Answer any Five of the following

5X5=25 Marks

1.

2.

3.

4.

5.

6.

7.

8.

9.

10

PART –B

Answer the following **5x10=50 Marks**

11a.

Or

11b.

12a.

Or

12b.

13a.

Or

13b.

14a.

Or

14b.

15a.

Or

15b.