School of Information Technology
Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal
New Scheme of Examination as per AICTE Flexible Curricula
Syllabus III Semester
B.Tech Computer Science and Engineering (Artificial Intelligence and Machine Learning)

AL 301 (DESIGN THINKING)

	Leadership Oriented Learning (LOL)	

Nature of Course	Behavioral
Pre requisites	Completion of all units from Semesters 1, 2, 3 and 4

Course Terminal Objectives:	
1	Recognize the importance of DT
2	Explain the phases in the DT process
3	List the steps required to complete each phase in DT process
4	Apply each phase in the DT process
5	Use doodling and storytelling in presenting ideas and prototypes
6	Create value proposition statements as part of their presentations
7	Recognize how DT can help in functional work
8	Recognize how Agile and DT complement each other to deliver customer satisfaction

Course Enabling Objectives:

Upon completion of the course, students shall have ability to

1	Recognize the importance of Design Thinking	[U]
2	Identify the steps in the DT process	[C]
3	Recognize the steps in the empathize phase of DT	[C]
4	Identify the steps required to conduct an immersion activity	[C]
5	Conduct an immersion activity and fill up the DT question template	[AP]
6	Recognize the steps to create personas in the define phase of DT	[C]
7	Create personas in the define phase of DT	[AP]
8	Recognize the steps to create problem statements in the define phase of DT	[AP]
9	Define the problem statements in the define phase of DT	[E]
10	Recognize the steps in the ideate phase of DT	[C]
11	Apply the steps in the ideate phase of DT	[AP]
12	Recognize how doodling can help to express ideas	[U]
13	Recognize the importance storytelling in presenting ideas and protypes	[U]
14	Recognize the importance of the prototype phase in DT	[C]
15	Create a prototype	[AP]

16	Recognize the importance of service value proposition	[C]
17	Create a value proposition statement	[AP]
18	Recognize the best practices of the testing phase in DT	[U]
19	Test a prototype created through a DT process	[AP]
20	Recognize how DT can help in functional work	[E]
21	Recognize how Agile and DT complement each other to deliver customer satisfaction	[C]

Course Contents:

Total Hours:	45 hours

Textbooks:

	There are no prescribed texts for Semester 5 – there will be handouts and referencelinks shared.

Reference Books:

1	Hooked by NirEyal
2	The Art of Creative Thinking by Rod Judkins
3	Start Up nation by Dan Senor and Saul singer
4	Start with Why by Simon Sinek

Web References:

1	What is Design Thinking? Interaction Design Foundation
2	What are some of the good examples of design thinking? - Quora
3	Design thinking 101: Principles, Tools & Examples to transform your creative process

Online Resources:

1	Understanding Design thinking WF NEN
2	Design Thinking and Innovation at Apple Wei Li
3	Stanford Webinar- Design Thinking = Method, Not Magic
4	Stanford Design Thinking Virtual Crash Course
5	So Many Uses- activity to spark creativity and design

Assessment Methods & Levels (based on Bloom's Taxonomy)

Formative assessment (Max. Marks:20)

Course Outcome	Bloom's Level	Assessment Component	Marks
	Apply	Defining problem statement	5
	Apply	Ideating solutions	5
	Apply	Creating a prototype	10

Summative Assessment based on End Semester Project

Bloom's Level		
Understand	Understand, Analyze, Apply	50
Apply		

Analyze	Conduct and apply DT in the project.	

Lesson Plan

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
1	Recognize the importance of Design Thinking	2	**Why is Design Thinkingimportant for business?** Stories and examples will be usedto introduce Design Thinking to the participants. We will use relevant stories and the followingvideos. 1. YouTube video: The DesignThinking Process – Sprouts(3.57 mins) 2. Leverage TCS-provided DT content to show the evolution of DT and why isimportant in present business environment. Canbe a video. (2 mins) Lecturer to encourage the students to maintain their Satorislam book and capture their learning points in it.	Introduction and discussion	60 mins
1	Recognize the importance of Design Thinking	2	**Why is Design Thinking importantfor you?** Experiential activity **Products that you loved and**	Activity	90 mins
Unit No	**Objective**	**Bloom's Level**	**Content**	**Type of Class**	**Duration**
			hated: In this activity, learners willhave to share about a product theylike of disliked based on their experience. What would they need in a badproduct to make it good?		

1	Identify the steps in the DT process	2	**What is DT?** Introduce the 5-Step Stanford Model using YouTube videos: The video will give a brief idea about the five steps: • Empathize (search for rich stories and find some love) • Define (user need and insights – their POV) • Ideate (ideas, ideas, ideas) • Prototype (build to learn) • Test (show, don't tell) Start all over and iterate the flow as much as possible	Lecture and demo	60 mins
1	Recognize the steps in the empathize phase of DT	2	**What is empathy?** Touch the target activity (Recap from Sem 2 Unit 4) Discussions in class Reference: FHIL | Stages of Design Thinking | EMPATHY (2:29 mins)	Activity	60 mins
1	Identify the steps required to conduct an immersion activity	1 and 2	**How to empathize?** Moccasin Walk activity for 1 hour to allow learners experience stepping into the shoes of another person. *This is an individual activity.* Sharing observations with the group. Suggest that students try this even in their free time away from studies.	Activity and lecture	90 mins
1	Identify the steps required to conduct an immersion activity	1 and 2	**Intro to Immersion Activity** Introduction to immersion activity through flowcharts and handouts and examples (to be provided by	Lecture	45 mins
Unit No	**Objective**	**Bloom's Level**	**Content**	**Type of Class**	**Duration**
			TCS DT Team) (steps and the question template: 1. We met; 2. We were amazed to realize that; 3. We wonder if this means 4. It would change the world if)		

1	Conduct an immersion activity and fill up the DT question template	3	**Immersion activity** Participants will be divided into four groups. Each group will need to visit any one of the following places to conduct an immersion activity. They need to interview people and fill up the DT question template (explained in the last class) 1. College cafeteria 2. College library 3. College sports facility 4. Transport facility near college	Practical	180 mins
2	Recognize the steps to create personas in the define phase of DT Create personas in the define phase of DT	2 3	**Creating personas** Start with YouTube videos explaining the process of persona creation: 1. Personas – What is a persona and how do I create one? (2019) https://www.youtube.com/watch?v=GNvLpfXCge8 Each group will create at least one persona based on the immersion study they conducted in the empathize stage (refer to the four question templates). The group can use A4 pages, colours and other props to create and display their respective persona. **Reference:** https://www.interaction-design.org/literature/article/personas-why-and-how-you-should-use- them	Lecture and practical	120 mins
Unit No	**Objective**	**Bloom's Level**	**Content**	**Type of Class**	**Duration**
			Lecturer to guide participants on getting the personas right (based on guidelines provided by TCS DT Team).		
2	Recognize the steps to create problem statements in the define phase of DT	2	**Problem statements** Session will begin with YouTube videos on how to define problem statements in the Define phase. 1. FHIL | Stages of Design Thinking | REFRAME (1:55 mins) Lecturer will provide examples	Lecture and demo	60 mins

			of problem statements in class (basedon handouts provided by TCS DT Team)		
2	Define the problem statements in thedefine phase of DT	3	**Defining problem statements** Group activity, in which each groupwill define the key problem statements (max three) for their lead personas. Each group will present while theremaining groups will do a peer review. Finally, lecturer will moderate/validate the problemstatements (based on handoutsprovided by TCS DT Team)	Formative assessmen t	90 mins
3	Recognize the steps in the ideatephase of DT	1 and 2	**How to Ideate?** The session will start with YouTubevideos:	Lecture and demo	60 mins
Unit No	**Objective**	**Bloom's Level**	**Conten t**	**Type of Class**	**Duratio n**
			1. FHIL | Stages of DesignThinking | IDEATE (1:54secs) 2. What Is Six Thinking Hats?(Litmos Heroes) (1:58 secs) Lecturer to briefly tell them about the guidelines of ideating (to beprovided by TCS DT Team)		
3	Apply the steps inthe ideate phase of DT	3	**Ideation games** Game 1: Six Thinking Hats Game 2: Million- dollar idea	Activity	90 mins
3	Apply the steps inthe ideate phase of DT	3	**Ideate to find solutions** Participants will work in their assigned groups to ideate solutionsfor the problem statements they identified (as continuation of immersion activity) applying ideation methods discussed in the previous session. They will get scores based on how well they canapply the ideation methods. Lecturers will observe the groups separately and assign them scoresbased on specific rubric (provided by the TCS DT Team).	Formative assessmen t	90 mins

3	Recognize how doodling can helpto express ideas	1	**Let's doodle!** Participants will first watch a videoon doodling: Doodling – how it can help in presenting ideas during ideate andprotype phases After that, participants will complete an activity on doodling.	Demo and activity	60 mins
3	Recognize the importance storytelling in presenting ideasand protypes	1	**What is Storytelling in DT?** Activity- Research to find out aboutpeople who have used DT in providing solutions. Present their findings in forms of stories. (Recapfrom Unit- Sem-) Suggested topics to be provided bythe TCS DT team.	Activity	120 mins
Unit No	**Objective**	**Bloom's Level**	**Conten t**	**Type of Class**	**Duratio n**
4	Recognize the importance of theprototype phase in DT	2	**Why is a Prototype important inDesign Thinking?** The session will start with an activity to drive home the importance of creating a prototypein the design thinking process. As part of debrief of the activity, lecturer will share relevant examples and prototyping guidelines (provided by the TCS DT Team). Finally, the participants will watchtwo YouTube videos: 1. FHIL | Stages of Design Thinking | PROTOTYPE 2. Prototyping Phase - Design Thinking | Coursera https://www.coursera.org/lecture/patient-safety-project-planning/prototyping-phase-jVuQn	Activity and demo	60 mins

4	Create a prototype	3	**Prototype your idea** This is a group activity in which theparticipants will work in groups (created at the beginning of the course, in which they did immersion, persona creation, defining problem statement and ideating) to create prototypes based on the solutions they had identified. Lecturer to share feedback based on guidelines provided by the TCsDT team.	Formative assessment	180 mins
4	Recognize the importance ofservice value proposition Create a value proposition statement	2 3	**Value Proposition Statement** You Tube: What is Value Proposition (by Venture Well)(3:51 mins)? Lecturer to discuss the guidelinesfor creating a value proposition	Lecture	120 mins 1635 mins
Unit No	**Objective**	**Bloom's Level**	**Content**	**Type of Class**	**Duration**
			statement (to be provided by theTCS DT Team) Each group now needs to create value proposition statement for the solution they have suggested.		
4	Recognize the best practices ofthe testing phasein DT	1	**Testing in Design Thinking** Participants will first watch aYouTube video: FHIL | Stages of Design Thinking |TESTING After that lecturers will explainthem the importance of Testingthe prototype through stories (provided by the TCS DT Team). They will also explain how the loop works in DT between the Empathize and Testing phases.	Lecture	60 mins
	Test a prototype created through aDT process	3	**Test the Prototype** Each group needs to test theirprototype created earlier and: 1. Document user feedback 2. Write down their inferencefrom the feedback 3. Suggest next steps (the	Activity	120 mins

			loop that happens in DT)		
4	Recognize how DTcan help in functional work	1	**Role of DT in your work** Lecturer conducts a group/openhouse discussion on: "How DT can help me to become abetter coder?" Lecturer needs to capture the key learning points in thesediscussions.	Discussion	60 mins
4	Recognize how Agile and DT complement eachother to deliver customer satisfaction	1	Suggested session on: **How Agile and DT complement each other to deliver customer satisfaction**	Lecture	45 mins
4			**Share your Satori** Participants will be asked to share their Satori moments from the DTsessions	Reflection activity	60 mins
Unit No	**Objective**	**Bloom's Level**	**Conten t**	**Type of Class**	**Duratio n**
					33 hours
			Project **Option 1:** Each group needs to present a Prototype of how theycan apply DT in their functional work or coding. Examples will beprovided to explain what exactlythey need to do. Option 2: Each group will apply DTto create a prototype to improve any existing product or service. For both options, groups need to complete all phases of the Stanford DT model and include theoutputs of each phase in their presentation. Lecturers will evaluate the projectbased on the rubric provided by the TCS DT Team.		12 hours
				Total	**45 hours**

SCHOOL OF INFORMATION TECHNOLOGY, RGPV, BHOPAL

AL-302 (COMPUTER ORGANIZATION AND ARCHITECTURE)

UNIT I- Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.
Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.
Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT II- Microprogrammed Control: Control memory, Address sequencing, micro program example, design of control unit.
Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT III- Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.
Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT IV- Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.
Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

UNIT V- Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.
Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.
Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor arbitration, Interprocessor communication and synchronization, Cache Coherence.

Reference Books-

1. Computer System Architecture – M. Moris Mano, Third Edition, Pearson/PHI.
2. Computer Organization – Car Hamacher, ZvonksVranesic, SafeaZaky, Vth Edition, McGraw Hill.
3. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
4. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson

Course Outcomes-

On successful completion of the course, the students will be able to:
CO1: Understand the basics of instructions sets and their impact on processor design.
CO2: Demonstrate an understanding of the design of the functional units of a digital computer system.
CO3: Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
CO4: Design a pipeline for consistent execution of instructions with minimum hazards.
CO5: Recognize and manipulate representations of numbers stored in digital computers

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AL-303 (DATA STRUCTURES AND ALGORITHMS)

Unit I Introduction: Data, data type, data object. Types of data structure – primitive &nonprimitive, linear & non-linear. Operations on data structures – traversing, searching, inserting, deleting, Complexity analysis – worst case, best case, and average case. Time – space trade off, algorithm efficiency, asymptotic notations – big oh , omega , theta.

Unit II Arrays & Structure: Introduction , declaration of arrays , operations on arrays – inserting , deleting , merging of two arrays , 1 dimensional & 2 dimensional arrays, row & column major representation , address calculation in array , storing values in arrays , evaluation of polynomial – addition & representation. Searching & sorting – Introduction, sequential search, binary search, Fibonacci search, indexed sequential search, hashed search. Types of sorting with general concepts – bubble, heap, insertion, selection, quick, heap, shell, bucket, radix and merge sort.

Unit III Stacks & Queues Basic concept of stacks & queues, array representation of stacks,operation on stacks – push , pop , create , getTop , empty , linked representation of stack ,multiple stack. Application of stack – Conversion: infix,prefix, postfix and evaluation ofarithmetic expression. Linked representation of queue, operations on queue – insertion &deletion. Types of queue with functions – circular,deque,and priority queue. Applications ofqueues – job scheduling, Josephus problem.

Unit IV Linked List Introduction – basic terminology, memory allocation & deallocation for linked list. Linked list variants – head pointer, head node, types linked list – linear & circular linked list. Doubly linked list, creation of doubly list, deletion of node from doubly linked list, insertion of a node from doubly linked list, traversal of doubly linked list. Circular linked list – singly circular linked list , circular linked list with header node , doubly circular linked list. Applications of linked list – polynomial representation & garbage collection.

Unit V Trees Basic terminology – general tree , representation of general tree, types of trees, binary tree- realization and properties , traversal in binary trees – inorder , preorder , postorder , applications of trees. Graph- Basic Terminologies and representations, Graph search and traversal algorithms.

Reference Books-

1.Varsha H. Patil "Data Structure Using C++" Oxford.
2. ReemaThareja" Data Structure Using C " Oxford.
3. D. S Malik "Data Structure Using C++ " Second Edition Cengage.
4. Kushwaha and Mishra "Data Structure: A programming Approach with C", PHI Learning.
5. A. K Sharma "Data Structure Using C" Pearson.
6. Ellis Horowitz, SartajSahni, "Fundamentals of Data Structures", Computer Science Press

Course Outcomes-

After the completion of this course, the students will be able to:
CO1: Implement searching algorithms (linear search and binary search) on given data
CO2: Perform operations on arrays
CO3: Implement programs using queues, stacks and link lists
CO4: Implement sorting operation using various algorithms and compare their performance
CO5: Implement tree, graph search and traversal algorithms

Suggested List of Experiments-

1. Write a program to search an element in the array using Linear and Binary Search.
2. Write a program to perform the following operation in Matrix:
a. Addition b. Subtraction c. Multiplication d. Transpose
3. Write a program to perform the following operation on strings using string functions:
a. Addition b. Copying c. Reverse d. Length of String
4. Write program for implementing the following sorting methods to arrange a list of integers in ascending order:
a) Quick sort b) Selection sort c) Insertion sort d) Merge sort
5. Write a program that uses stack operations to convert a given infix expression into its postfix

equivalent.
6. Write a program to merge two sorted array into one sorted array.
7. Write a program to implement stack using array and linked list.
8. Write a program to implement queue and circular queue using array.
9. Write a program to insert an element in the beginning and end of singly linked list.
10. Write a program to insert an element at any position in singly and doubly linked list.
11. Insert and delete a node at any position in doubly linked list.
12. Write a program of Tower of Hanoi.
13. Write a program that uses functions to perform the following:
a) Create a binary search tree of integers.
b) Traverse the above Binary search tree non recursively in in order.

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AL-304 (DATABASE MANAGEMENT SYSTEMS)

Unit I Basic Concepts: Introduction to DBMS, File system vs DBMS, Advantages of database systems, Database System architecture, Data models, Schemas and instances, Data independence, Functions of DBA and designer, Entities and attributes, Entity types, Key attributes, Relationships, Defining the E-R diagram of database.

Unit II Relational Model: Structure of relational databases, Domains, Relations, Relational algebra – fundamental operators and syntax, relational algebra queries, Entity-Relationship Model: Basic concepts, Design process, constraints, Keys, Design issues, E-R diagrams, weak entity sets, extended E-R features –generalization, specialization and aggregation

Unit III SQL: Data definition in SQL, update statements and views in SQL: Data storage and definitions, Data retrieval queries and update statements, Query Processing & Query Optimization: Overview, measures of query cost, selection operation, sorting, join, evaluation of expressions, transformation of relational expressions, estimating statistics of expression results, evaluation plans. Case Study of ORACLE and DB2.

Unit IV Relational Database design: Functional Dependency –definition, trivial and non-trivial FD, closure of FD set, closure of attributes, irreducible set of FD, Normalization –1NF, 2NF, 3NF, Decomposition using FD-dependency preservation, lossless join, BCNF, Multi-valued dependency, 4NF, Join dependency and 5NF

Unit V Introduction of transaction, transaction processing and recovery, Concurrency control: Lock management, specialized locking techniques, concurrency control without locking, Protection and Security Introduction to: Distributed databases, Basic concepts of object oriented data base system.

Reference Books-

1. Korth, Silbertz, Sudarshan, "Database Concepts", Mc Graw Hill.
2. Elmasri, Navathe, "Fundamentals of Database Systems", Pearson.
3. Ivan Bayross, "SQL, PL/SQL the Programming Language of Oracle", BPB publications.
4. S. Sharma, J. Agrawal, S. Agrawal, "Advanced Database Management System", Dreamtech Press.
5. Leon & Leon, "Fundamental of Data Base Management System",TMH

Course Outcomes-

After successful completion of this course, the students would be able to:

CO1: Analyze the physical and logical database designs, database modeling, relational, hierarchical, and network models

CO2: Use DDL, DML and DCL utilities to implement the schema using a DBMS.

CO3: Formulate data retrieval queries in SQL and Relational Algebra.

CO4: Demonstrate an understanding of functional dependencies, normalization theory and apply such knowledge to the design of database.

CO5: Understand concepts of Transaction Processing, Concurrency Control, distributed database and big data.

Suggested List of Experiments-

1. To perform various SQL Commands of DDL, DML, DCL.
2. Write SQL Commands such as Insertion, deletion and updation for any schema.
3. To execute Nested Queries, Join Queries, order-by, having clause and string operation.
4. To perform set operators like Union, Intersect, Minus on a set of tables.
5. To execute various commands for GROUP functions (avg, count, max, min, Sum).
6. Write a PL/SQL block for transaction application usingTriggers.
7. Write a DBMS program to prepare report for an application using function.
8. Designing of various Input screens/Forms.
9. Create reports using database connectivity of Front end with back end.
10. Create database Design with normalization and implementing in any application.

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AL-305 (INTRODUCTION TO MACHINE LEARNING)

Unit I Introduction to Machine Learning: Basic Concepts of Machine Learning, Types of Learning: Supervised, Unsupervised and Reinforcement Learning, Categorical and Continuous Data, Skewness and Correlation, Regression Analysis Vs Classification.

Unit II Supervised Learning: Linear and Logistic Regression, Linear models for classification, Sigmoid, Logistic regressions with single and multiple variables, Polynomial regression. Training and testing classifier models, Cross-validation, Model evaluation (precision, recall, F1-mesure, accuracy, area under curve), Statistical decision theory including discriminant function and decision surfaces, Naive Bayes classification, Bayesian networks, Decision Tree and Random Forests, k- Nearest neighbor classification, least squares regression, Regularization, LASSO, Applications of regression and classification.

Unit III Unsupervised Learning: Clustering, Common distance measures, Hierarchical algorithms – agglomerative and divisive, partitioning algorithms – k-means and derivatives, Design and Analysis of Machine Learning Experiments: Guidelines for machine learning experiments, Factors, Response, and Strategy of experimentation, Resampling methods, measuring classifier performance.

Unit IV Hidden Markov Models (HMM) with forward-backward and Vierbi algorithms, Sequence classification using HMM, Conditional random fields, Applications of sequence classification such as part-of-speech tagging.

Reinforcement Learning, RL-framework, Support Vector Machines, Artificial neural networks including back propagation, ensembles of classifiers including bagging and boosting.

Unit V Association rule mining algorithms including apriori, Expectation-Maximization (EM) algorithm for unsupervised learning. Clustering: Average linkage, Ward's algorithm, Minimum spanning tree clustering, BIRCH, CURE, DBSCAN, Anomaly and outlier detection methods.

List of Experiments

1. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
2. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file. A python program to implement decision tree
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Python ML libraries.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the support vector Classifier model to perform this task. Python can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Python ML libraries can be used for this problem.
8. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
9. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
10. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Python ML API in the program.
11. Implementation of a mini project – Stock prices predictor/ Sports predictor/ Sentiment analyzer/ Healthcare predictor.

Text Books:

1. Machine Learning, Tom M. Mitchell, vMcGraw-Hill
2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007
4. E. Alpaydin, Introduction to Machine Learning (3rd ed.), PHI, 2015. ISBN 978-8120350786.

References:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis
2. Machine Learning: The art and science of algorithms that make sense of data, Peter Flash, Cambridge. University press
3. The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer 2009
4. Pattern Classification, 2/e, R.O. Duda, P.E. Hart, D.G. Stork, Wiley, 2001
5. Pattern Recognition and Machine Learning, C. Bishop, Springer, 2007
6. Introduction to Machine Learning, 3/e, E. Alpaydin, Prentice-Hall, 2014
7. Foundations of Machine Learning, A.Rostamizadeh, A. Talwalkar, M. Mohri, MIT Press
8. Statistical Pattern Recognition, 3/e, A. Webb, Wiley, 2011

Course Outcomes-

After completion of the course students would be able to:

CO1. Understand basic concepts of Machine Learning.
CO2. Compare different data types in Machine Learning
CO3. Understand basic concepts of Machine Learning.
CO4. Explain various supervised and unsupervised learning approaches
CO5. Compare various machine learning models

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AL 306 (COMPUTER PROGRAMMING III)
PYTHON

Unit I

Introduction to python language, Basic syntax, Literal Constants, Numbers, Variable and Basic data types,String, Escape Sequences, Operators and Expressions, Evaluation Order, Indentation, Input, Output, Functions, Comments.

Unit II

Data Structure: List, Tuples, Dictionary, DataFrame and Sets, constructing, indexing, slicing and content manipulation.

Unit III

Control Flow:Conditional Statements - If, If-else, Nested If-else. Iterative Statement - For, While, Nested Loops. Control statements - Break, Continue, Pass.

Unit IV

Object oriented programming:Class and Object, Attributes, Methods, Scopes and Namespaces, Inheritance, Overloading, Overriding, Data hiding,Exception: Exception Handling, Except clause, Try finally clause, User Defined Exceptions.

Unit V

Modules and Packages: Standard Libraries: File I/0, Sys, logging, Regular expression, Date and Time, Network programming, multi-processing and multithreading.

Reference Books-

1. Timothy A. Budd: Exploring python, McGraw-Hill Education.
2. R.NageshwarRao ,"Python Programming" ,Wiley India
3. Think Python: Allen B. Downey, O'Reilly Media, Inc.

Suggested List of Experiments

1. To write a Python program to find GCD of two numbers.
2. To write a Python Program to find the square root of a number by Newton's Method.
3. To write a Python program to find the exponentiation of a number.
4. To write a Python Program to find the maximum from a list of numbers.
5. To write a Python Program to perform Linear Search
6. To write a Python Program to perform binary search.
7. To write a Python Program to perform selection sort.
8. To write a Python Program to perform insertion sort.
9. To write a Python Program to perform Merge sort.
10. To write a Python program to find first n prime numbers.
11. To write a Python program to multiply matrices.
12. To write a Python program for command line arguments.
13. To write a Python program to find the most frequent words in a text read from a file.
14. To write a Python program to simulate elliptical orbits in Pygame.
15. To write a Python program to bouncing ball in Pygame.