SHRI SHANKARACHARYA TECHNICAL CAMPUS
Shri Shankaracharya Group of Institutions
Faculty of Engineering & Technology
(Managed by Shri Gangajali Education Society, Bhilai)
JUNWANI, BHILAI-490 020 (CHHATTISGARH), INDIA
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DEPARTMENT OF INFORMATION TECHNOLOGY

M. Tech Information Technology

(Artificial Intelligence & Machine Learning)

Scheme & Syllabus

Submitted Under

BOS Information Technology

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Scheme of Teaching and Examination

M.Tech. (Information Technology)

(Specialization in AI & Machine Learning).

Semester – I

S. No.	Board of Study	Subject Code	Subject	Periods			Scheme of Examination Theory/Practical			Total Marks	Credit L(T+P)/ 2
				L	T	P	ESE	CT	TA		
1	Information Tech.	IT 232101	Soft Computing	3	1	-	100	20	20	140	4
2	Information Tech.	IT 232102	Artificial Intelligence : Principles & Techniques	3	1	-	100	20	20	140	4
3	Information Tech.	IT 232103	Mathematical Foundation of Computer Science	3	1	-	100	20	20	140	4
4	Information Tech.	IT 232104	Advanced Data Structure	3	1	-	100	20	20	140	4
5	Information Tech.	**Elective –I**		3	1	-	100	20	20	140	4
6	Information Tech.	IT 232191	AI Techniques Lab	-	-	3	75	-	75	150	2
7	Information Tech.	IT 232192	Advance Data Structure Lab	-	-	3	75	-	75	150	2
Total				**15**	**5**	**6**	**650**	**100**	**250**	**1000**	**24**

L-Lecture, T- Tutorial, P-Practical, ESE- End Semester Examination, CT- Class Test, TA- Teacher's Assessment

Note: Duration of all theory papers will be of Three Hours.

Elective-I			
S. No.	**Board of Study**	**Subject Code**	**Subject Name**
1	Information Tech.	IT 232121	Data Warehousing & Mining
2	Information Tech.	IT 232122	Image & Video Analytics
3	Information Tech.	IT 232123	Distributed Systems
4.	Information Tech.	IT 232124	Cloud Computing

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Semester – II

S. No.	Board of Study	Subject Code	Subject	Periods			Scheme of Examination Theory/Practical			Total Marks	Credit L(T+P)/2
				L	T	P	ESE	CT	TA		
1	Information Tech.	IT 232201	Internet of Things	3	1	-	100	20	20	140	4
2	Information Tech.	IT 232202	Big Data Analytics	3	1	-	100	20	20	140	4
3	Information Tech.	IT 232203	Machine Learning Techniques	3	1	-	100	20	20	140	4
4	Information Tech.	IT 232204	Information Security Techniques	3	1	-	100	20	20	140	4
5	Information Tech.	Elective -II		3	1	-	100	20	20	140	4
6	Information Tech.	IT 232291	IOT Lab	-	-	3	75	-	75	150	2
7	Information Tech.	IT 232292	Machine Learning Lab	-	-	3	75	-	75	150	2
Total				**15**	**5**	**6**	**650**	**100**	**250**	**1000**	**24**

L-Lecture, T- Tutorial, P - Practical, ESE- End Semester Examination, CT- Class Test, TA- Teacher's Assessment
Note: Duration of all theory papers will be of Three Hours.

Elective-II			
Sr.No.	**Board of Study**	**Subject Code**	**Subject Name**
1	Information Tech.	IT 232221	Intelligent Information Retrieval
2	Information Tech.	IT 232222	Research Methodology & IPR
3	Information Tech.	IT 232223	Wireless Sensor Networks
4	Information Tech.	IT 232224	Computer Vision

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Semester – III

S. No.	Board of Study	Subject Code	Subject	Periods			Scheme of Examination Theory/Practical			Total Marks	Credit L(T+P)/ 2
				L	T	P	ESE	CT	TA		
1	Information Tech	IT 232301	Deep Learning & its Applications	3	1	-	100	20	20	140	4
2	Refer Table - III		Elective –III	3	1	-	100	20	20	140	4
3	Information Tech	IT 232391	Preliminary Work on Dissertation	-	-	28	100	-	100	200	14
4	Information Tech	IT 232392	Seminar	-	-	3	-	-	20	20	2
Total				**6**	**2**	**31**	**300**	**40**	**160**	**500**	**24**

L-Lecture, T- Tutorial, P - Practical, ESE- End Semester Examination, CT- Class Test, TA- Teacher's Assessment Note: Duration of all theory papers will be of Three Hours.

Elective-II			
Sr. No.	**Board of Study**	**Subject Code**	**Subject Name**
1	Information Technology	IT 232321	Advances in Cryptography & N/w Security
2	Information Technology	IT 232322	Pattern Recognition
3	Information Technology	IT 232323	Natural Language Processing Techniques
4.	Information Technology	IT 232324	Data visualization

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Semester – IV

S. No.	Board of Study	Subject Code	Subject	Periods			Scheme of Examination			Total Marks	Credit L(T+P)/2
							Theory/Practical				
				L	T	P	ESE	CT	TA		
1	Information Technology	IT 232491	Project+ Seminar	6	-	34	300	-	200	500	**23**
Total				**6**	**-**	**34**	**300**	**-**	**200**	**500**	**23**

L- Lecture T- Tutorial P- Practical ,
ESE- End Semester Exam CT- Class Test TA- Teacher's Assessment

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SCHEME OF EXAMINATION AND SYLLABUS

First Year (1st semester) M. Tech. [IT]

(Specialization in AI& Machine Learning).

Subject Code	Soft Computing	L = 3	T = 1	P = 0	Credits = 4
IT 232101	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To introduce soft computing concepts and techniques and foster their abilities in appropriate technique for a given scenario. 2. To implement soft computing based solutions for real-world problems. 3. To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms. 4. To provide student a hand-on experience on MATLAB to implement various strategies. 5. To introduce ANNs architecture.	On successful completion of course,student will be able to **CO1:-**Identify and describe soft computing techniques and their roles in building intelligent machines **CO2: -**Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems **CO3:-**Apply genetic algorithms to combinatorial optimization problems. **CO4:-**Evaluate and compare solutions by various soft computing approaches for a given problem**.** **CO5:-**Apply ANNs to solve .real-life problems

UNIT I:Introduction to Soft Computing:- CO1

Concept of computing systems ,"Soft" computing versus "Hard" computing ,Characteristics of Soft computing ,Some applications of Soft computing techniques. , From Conventional AI to Computational Intelligence: Machine Learning Basics. [5Hrs]

UNIT II:Fuzzy Logic:- CO2

Introduction to Fuzzy logic, Fuzzy sets and membership functions, Operations on Fuzzy sets,Fuzzy relations, rules, propositions, implications and inferences, De-fuzzification techniques, Fuzzy logic controller design, Some applications of Fuzzy logic. Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making. [4Hrs]

UNIT III: Genetic Algorithms:- CO3

Concept of "Genetics" and "Evolution" and its application to probabilistic search techniques, Basic GA framework and different GA architectures, GA operators: Encoding, Crossover, Selection, Mutation, etc. Solving single-objective optimization problems using GAs. [4Hrs]

Subject Code	Soft Computing	L = 3	T = 1	P = 0	Credits = 4
IT 232101	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

UNIT IV: Multi-objective Optimization Problem Solving:- **CO4**

Concept of multi-objective optimization problems (MOOPs) and issues of solving them, Multi-Objective Evolutionary Algorithm (MOEA),Non-Pareto approaches to solve MOOPs ,Pareto-based approaches to solve MOOPs ,Some applications with MOEAs. [4Hrs]

UNIT V : Artificial Neural Networks :- **CO5**

Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks: Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures. Biological neurons and its working, Simulation of biological neurons to problem solving, Different ANNs architecture, Training techniques for ANNs, Applications of ANNs to solve some real-life problems. [4Hrs]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications.	S. Rajasekaran, G. A. Vijayalakshami	Kindle Edition	PHI.
2	Genetic Algorithms: Search and Optimization	E. Goldberg.	-----	Addison-Wesley Longman Publishing Co., Inc.75 Arlington Street, Suite 300 Boston, MA United States.

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Neuro-Fuzzy Systems	Chin Teng Lin, C. S. George Lee		PHI
2	Build_Neural_Network_With_ MS_Excel	sample by Joe choong.		
3.	Neural Networks and Learning Machines	Simon Haykin	3rd Edn.	PHI Learning, 2011

		October 2020	1.00	Applicable for AY 2020-21 Onwards
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SCHEME OF EXAMINATION AND SYLLABUS

First Year (1st semester) M. Tech. [IT]

(Specialization in AI & Machine Learning).

Subject Code	Artificial Intelligence : Principles & Techniques	L = 3	T = 1	P = 0	Credits = 4
IT 232102	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To understand basic principles of Artificial Intelligence 2. To learn and design intelligent agents 3. To understand the basic areas of artificial intelligence including problem solving, knowledge representation, reasoning, decision making, planning, perception and action. 4. To master the fundamentals of machine learning, mathematical framework and learning algorithm. 5. To understand the real time approach of AI.	On successful completion of course, student will be able to **CO1:-**Understand formal methods of knowledge representation, logic and reasoning **CO2:-**Understand foundational principles, mathematical tools and program paradigms of artificial intelligence understand the fundamental issues and challenges of machine learning: data, model selection, model complexity. **CO3:-**Analyze the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning **CO4:-**Apply intelligent agents for Artificial Intelligence programming techniques **CO5:-** Need for justification of expert system in AI.

UNIT I: Automated Reasoning – CO1

foundations of knowledge representation and reasoning, representing and reasoning about objects, relations, events, actions, time, and space; predicate logic, situation calculus, description logics, - Logic - Propositional and predicate logic - Syntax - Informal and formal semantics - Equivalence - De Morgans laws - Decidable problems - Many-sorted logic -first-order, higher-order logic- Reasoning methods - Formal program techniques - pre- and post-conditions, derivation and verification of programs. [5Hrs]

UNIT II : Uncertain Knowledge Bayesian networks; CO2

Basics of decision theory, sequential decision problems, elementary game theory; Problem-solvingthroughSearch-forwardandbackward, state-space, blind, heuristic, problem-reduction, A, A*, AO*, minimax, constraint propagation, neural and stochastic; Introduction to intelligent agents. [5Hrs]

UNIT III : Introduction to ANN: C03

Neuron, Biological Neuron and synapse, Artificial Neuron and its model, Learning Paradigms supervised and unsupervised, reinforcement learning, ANN training, activation functions, Neural network architecture: single layer and multilayer feed forward networks. [5Hrs]

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Subject Code	Artificial Intelligence : Principles & Techniques	L = 3	T = 1	P = 0	Credits = 4
IT 232102	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

UNIT IV : **Natural Language Processing (NLP) & Planning**: CO4

Overview of NLP tasks, Parsing, Machine translation, Components of Planning System, Planning agent, State-Goal & Action Representation, Forward planning, backward chaining, Planning example: partial-order planner, Block world. [4Hrs]

UNIT V: **Expert System & AI languages**: C05

Need & Justification for expert systems- cognitive problems, Expert System Architectures, Rule based systems, Non production system, knowledge acquisition, Case studies of expert system. Ai language: Prolog syntax, Programming with prolog, backtracking in prolog, Lisp syntax, Lisp programming. [5Hrs]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications"	S. Rajsekaran & G.A. Vijayalakshmi Pai	Third edition	Prentice Hall of India
2	Artificial Intelligence: A Modern Approach	Russell, Norvig	Third edition	PrenticeHall,2010

ReferenceBooks:

S. No.	Title	Authors	Edition	Publisher
1	Neural Netowrks	Simon Haykin	Fourth edition	Prentice Hall of India
2	Fuzzy Logic with Engineering Applications	Timothy J. Ross	Third edition	Wiley India.
3.	Neural Networks	Kumar Satish	Fifth edition	Tata Mc Graw Hil

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Subject Code	Mathematical Foundation of Computer Science	L = 3	T = 1	P = 0	Credits = 4
IT 232103	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To understand the mathematical fundamentals that is prerequisites for avariety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning. 2. To develop the understanding of the mathematical and logical basis to many modern techniques in information technology like machine learning, programming language design, and concurrency. 3. To study various sampling and classification problems. 4. To understand the Machine Learning concept for Computer Science.	On successful completion of course, student will be able to **CO1**:-To understand the basic notatiions of discrete and continuous probability. **CO2**:-To understand the methods of statistical inference, and the role that sampling distributions play in those methods. **CO3:**-To be able to perform correct and meaningful statistical analyses of simple to moderate complexity. **CO4:**-To apply Specialized techniques to solve combinatorial enumeration problems **CO5:**-To Apply Machine Learning concept for Computer Science and Engineering Applications

UNIT I : Probability Theory: **CO1**

Probability mass, density, and cumulative distribution functions, Parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains [5Hrs]

UNIT II : Sampling Distributions & Methods: **CO2**

Random samples, sampling distributions of estimators, Methods of Moments and Maximum Likelihood. [4Hrs]

UNIT III : **Statistical Models:** **CO3**

Statistical inference, Introduction to multivariate statistical models: regression and classification problems, principal components analysis, The problem of over fitting model assessment.

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Subject Code	Mathematical Foundation of Computer Science	L = 3	T = 1	P = 0	Credits = 4
IT 232103	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

UNIT IV : Graph Theory: **CO4**

Isomorphism, Planar graphs, graph colouring, hamilton circuits and euler cycles.Permutations and Combinations with and without repetition. Specialized techniques to solve combinatorial enumeration problems [4Hrs]

UNIT V : Computer Science and Engineering Applications : **CO5**

Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Machine learning. Recent Trands in various distribution functions in mathematical field of computer science-Computer vision. [4Hrs]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Foundation Mathematics for Computer Science.	John Vince	Second Edition	Springer
2	Probability and Statistics with Reliability, Queuing, and Computer Science Applications.	K. Trivedi	Second Edition	Wiley

ReferenceBooks:

S. No.	Title	Authors	Edition	Publisher
1.	Probability and Computing: Randomized Algorithms and Probabilistic Analysis	M. Mitzenmacher and E. Upfal	Second Edition	Cambridge University Press.
2.	Applied Combinatorics.	Alan Tucker	Third Edition	Wiley

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Subject Code	Advance Data Structures	L = 3	T = 1	P = 0	Credits = 4
IT 232104	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. The student will be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem. 2. Students will be able to understand the necessary mathematical abstraction to solve problems 3. To familiarize students with advanced paradigms and data structure used to solve algorithmic problems. 4. Student will be able to come up with analysis of efficiency and proofs of correctness. 5. Student will be able to understand Computational Geometry.	On successful completion of course,student will be able to **CO1:**-Understand the implementation of symbol table using hashing techniques **CO2:**-Develop and analyze algorithms forred-blacktrees, B-trees and Splay trees. **CO3:**-Develop algorithms for text processing applications. **CO4:**-Identify suitable data structure sand develop algorithms for computational geometry problems. **CO5:**- Apply Two-Dimensional Range Searching

UNIT I: Dictionaries: **CO1**

Definition, Dictionary Abstract Data Type, and Implementation of Dictionaries.

Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing, Recent Trends in Hashing, Trees, and various computational geometry methods for efficiently solving the new evolving problem [5Hrs]

UNIT II: Skip Lists: **CO2**

Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists. [4Hrs]

UNIT III: Trees: **CO3**

Binary Search Trees, AVL Trees, Red BlackTrees,2-3Trees,B-Trees,Splay Trees. [5Hrs]

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Subject Code	Advance Data Structures	L = 3	T = 1	P = 0	Credits = 4
IT 232104	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

UNIT IV Text Processing: **CO4**

Sting Operations, Brute-Force Pattern Matching, The Boyer- Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common, Subsequence Problem(LCS), Applying Dynamic Programming to the LCS Problem. [4Hrs]

UNIT V: Computational Geometry: **CO5**

One Dimensional Range Searching, Two-Dimensional Range Searching, constructing Priority Search Tree, Searching a Priority Search, Tree, Priority Range Trees, Quadtrees, k-D Trees. [4Hrs]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Advance data structures	Peter Brass	-------	Cambridge University Press

ReferenceBooks:

S. No.	Title	Authors	Edition	Publisher
1	Data Structures and Algorithms: Concepts - Techniques and Applications	Thomas H. Cormen et.al	Second	Tata McGraw Hill publication

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SCHEME OF EXAMINATION AND SYLLABUS

First Year (1st semester) M. Tech. [IT]

(Specialization in AI & Machine Learning).

Subject Code	Data Mining and Warehousing	L = 3	T = 1	P = 0	Credits = 4
IT 232121	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. The objective of this course is to introduce data warehousing and mining techniques. 2. To learn data analysistechniques. 3. To understand Data mining techniques andalgorithms. 4. Comprehend the data mining environments andapplication. 5. Application of data mining in web mining, pattern matching and cluster analysis is included to aware students of broad data mining areas.	On successful completion of course, student will be able to **CO1:-**Study of different sequential pattern algorithms **CO2:-**Study the technique to extract patterns from time series data and it application in real world. **CO3:-**Can extend the Graph mining algorithms to Web mining **CO4:-**Help in identifying the computing framework for Big Data **CO5:-** Apply data mining in web mining,

UNIT I: Introduction to Data Mining: **CO1**

Introduction to Data Warehousing; Data Mining, Data mining-KDD versus data mining, stages of the Data Mining Process-Task primitives, Data Mining Techniques -Data mining knowledge Mining frequent patterns, association and correlations; Data preprocessing- Data cleaning-Data transformation- feature selection- Dimensionality reduction-Discretization and generating concept hierarchies-Mining Sequential Pattern Mining concepts, frequent patterns-association-correlation. [5Hrs]

UNIT II: Classification and Clustering: **CO2**

Decision Tree Induction -Bayesian Classification -Rule Based Classification by Back propagation – Support Vector Machines -Associative Classification –Lazy Learners -Other Classification Methods – Clustering techniques –Partitioning methods- k-means- Hierarchical hods – Distance based agglomerative and divisible clustering -Density-Based Methods – Expectation maximization -Grid Based Methods – Model-Based Clustering Methods –Constraint –Based Cluster Analysis –Outlier Analysis. [4Hrs]

UNIT III: Data mining software and Application: **CO3**

Mining complex data object- spatial database, temporal database, multimedia database-time series and sequence data text mining-graph mining –web mining-application trends in data mining, Periodicity Analysis for time related sequence data, Trend analysis, Similarity search in Time-series analysis; [4Hrs]

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Subject Code	Data Mining and Warehousing	L = 3	T = 1	P = 0	Credits = 4
IT 232121	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

UNIT IV: Prediction of quantitative variables: **CO4**

Prediction of quantitative variables non-parametric estimation- Logical regression – Projection pursuit – Inferential aspects Regression trees – Neural networks – Case studies. [4Hrs]

UNIT V: Web mining Techniques: **CO5**

Web Mining, Mining the web page layout structure, mining web link structure, mining multimedia data on the web, Automatic classification of web documents and web usage mining; Distributed Data Mining. Recent trends in Distributed Warehousing and Data Mining, Class Imbalance Problem; Graph Mining; Social Network Analysis [4Hrs]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Data Mining Concepts and Techniques	Jiawei Han and M Kamber	Second Edition	Elsevier Publication,2011
2	Introduction to Data Mining-	Pang-Ning Tan, Michael Steinbach Vipin Kumar	Second Edition	Addison Wesley, 2006
3.	Data Analysis and Data mining	Adelchi Azzalini, Bruno Scapa	2nd Edition	Oxford Uni- versity Press Inc., 2012.

ReferenceBooks:

S. No.	Title	Authors	Edition	Publisher
1	Data Mining: Concepts and Techniques	Jiawei Hanand Micheline Kamber	3rdEdition	Morgan Kaufmann Publishers, 2011
2	Data Warehousing, Data Mining & OLAP	Alex Berson and Stephen J. Smith	10th Edition	TataMcGraw Hill Edition,2007
3.	Introduction to Data Mining with Case Studies	G. K. Gupta	1st Edition	Easter Economy Edition, PHI,2006

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SCHEME OF EXAMINATION AND SYLLABUS

First Year (1st semester) M. Tech. [IT]

(Specialization in AI & Machine Learning).

Subject Code	Image and Video Analytics Specialization	L = 3	T = 1	P = 0	Credits = 4
IT 232122	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To teach the fundamentals of digital image processing, image and video analysis. 2. To understand the real time use of image and video analytics. 3. To demonstrate real time image and video analytics applications and others. 4. To understand the basic concepts of fundamentals of spatial filtering. 5. To understand the basic concept of analysis of Image using Huffman coding & Run length coding	On successful completion of course, student will be able to **CO1:-**Students will be able to describe the fundamental principles of image. **CO2:-**Students will be able to describe Fundamentals of spatial filtering. **CO3:-**Students will be able to analyse the Images using various Coding Techniques. **CO4:-**Students are able to describe the fundamental principles of video analysis and have an idea of their applications. **CO5:-**Student will be able to apply image and video analysis approaches to solve real world problems.

UNIT I: Digital image representation-Visual Perception-Sampling and Quantization-Basic Relations Between Pixels Mathematical Tools Using Digital Image Processing: **CO1**

Fundamental Operations –Vector and Matric Operations- Image Transforms (DFT, DCT, DWT, Hadamard). [4Hrs]

UNIT II: **Fundamentals of spatial filtering:** **CO2**

spatial correlation and convolution-smoothing blurring- sharpening- edge detection - Basics of filtering in the frequency domain: smoothing-blurring- sharpening– Histograms and basic statistical models of image. [4Hrs]

UNIT III: Image Analysis: **CO3**

Huffman coding, Run length coding, LZW coding, Lossless Coding, Wavelets based image compression. [4Hrs]

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Subject Code	Image and Video Analytics Specialization	L = 3	T = 1	P = 0	Credits = 4
IT 232122	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

UNIT IV: Vdeo Analytics : **CO4**

Video Compression: Basic Concepts and Techniques of Video Coding and the H.264 Standard, MPEG-1 and MPEG-2 Video Standards [4Hrs]

UNIT V: Object detection and recognition in image and video: **CO5**

Texture models Image and Video classification models- Object tracking in Video. Applications and Case studies- Industrial- Retail-Transportation & Travel Remote sensing-Video Analytics in WSN: IoT Video Analytics Architectures. [4Hrs]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Digital Image Processing	R.C. Gonzalez and R.E. Woods	3rd Edition	Addison Wesley
2	Non parametric and Semi parametric Models	W.Härdle, M.Müller,S.Sperlich ,A.Werwatz	3rd Edition	Springer, 2004

ReferenceBooks:

S. No.	Title	Authors	Edition	Publisher
1	Computer Vision: Algorithms and Applications	Rick Szelisk	2011	Springer 2011
2	Intelligent Video Surveillance Systems	Jean-Yves Dufour	2013	Wiley,2013
3.	Video Analytics for Business Intelligence	Caifeng Shan, FatihPorikli, Tao Xiang, Shaogang Gong	2012	Springer 2012
4.	Intelligent Transport Systems: Technologies and Applications	AsierPerallos, Unai Hernandez-Jayo, Enrique Onieva, Ignacio Julio GarcíaZuazola	2015	Wiley,2015

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SCHEME OF EXAMINATION AND SYLLABUS

First Year (1st semester) M. Tech. [IT]

(Specialization in AI & Machine Learning).

Subject Code	Distributed Systems	L = 3	T = 1	P = 0	Credits = 4
IT 232123	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To introduce the fundamental concepts and issues of managing large volume of shared data in a parallel and distributed environment. 2. To provide insight in to related research problems. 3. To understand the Reliability issues in DDBSs. 4. To understand the Parallel Database Systems using architecture.	On successful completion of course, student will be able to **CO1:**-Design trends in distributed systems. **CO2:**-Apply network virtualization. **CO3:**-Apply remote method invocation and objects**.** **CO4: - Resolve** Reliability issues in DBMS using different techniques. **CO5:**- USE Parallel Database Systems with architecture.

UNIT I : Introduction: **CO1**

Distributed data processing; DDBS : Advantages and disadvantages; Problem areas; Overview of data base and computer network concepts Distributed Database Management System Architecture Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues. [4Hrs]

UNIT II : Distributed Database Design: **CO2**

Alternative design strategies; Distributed design issues; Fragmentation; Data allocation

Semantics Data Control : View management; Data security; Semantic Integrity Control.

QUERY PROCESSING ISSUES : Objectives of query processing; Characterization of query processors ;Layers of query processing; Query decomposition; Localization of distributed data. [4Hrs]

UNIT III: Distributed Query Optimization: **CO3**

Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms

Transaction Management : The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models

Concurrency Control : Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management. [4Hrs]

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IT 232123	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

UNIT IV: Reliability: **CO4**

Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols. [4Hrs]

UNIT V :-Parallel Database Systems: **CO5**

Parallel architectures; parallel query processing and optimization; load balancing. [4Hrs]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Distributed Database Systems	D.BellandJ.Grimson,Addison	1992	Wesley,1992
2	Distributed Systems: Principles and Paradigms	Andrew S. Tanenbaum. Maarten Van Steen	2nd Edition	Pearson

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Principles of Distributed Database Systems	M.T.Ozsuand P.Valduriez	Third Edition.	Prentice-Hall,1991
2	Distributed Systems: Concepts and Design	Coulouris, George, Dollimore, and Paradigms	5th Edition	Pearson

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SCHEME OF EXAMINATION AND SYLLABUS

First Year (1st semester) M. Tech. [IT]

(Specialization in AI & Machine Learning).

Subject Code	Cloud Computing	L = 2	T = 0	P = 0	Credits = 2
IT 232124	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. The students will learn how to apply trust-based security model to real-world security problems. 2. To learn an overview of the concepts , processes, and best practices needed to successfully secure information within Cloud infrastructures. 3. Students will learn the basic Cloud types and delivery models and develop an understanding, of the risk and compliance responsibilities and Challenges for each Cloud type and service. 4. To understand the Security Issues in Cloud Computing. 5. To know how to handle Security Management in the Cloud.	On successful completion of course, student will be able to **CO1:-**Identify security aspects of each cloud model Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems **CO2:-**Develop a risk-management strategy for moving to the Cloud **CO3:-**Implement a public cloud instance using a public cloud service provider **CO4:-**Apply trust-based security model to different layer **CO5:-**Attempt to generate new ideas and innovations in cloud computing.

UNIT I: Introduction to Cloud Computing: **CO1**

Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing [4Hrs]

UNIT II: Cloud Computing Architecture: **CO2**

Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level, Security in Cloud computing environments, CPU Virtualization, A discussion on Hypervisors Storage Virtualization Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model

Cloud Deployment Models: Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise [5Hrs]

UNIT III: Security Issues in Cloud Computing: **CO3**

Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security Identity and Access Management: Trust Boundaries and IAM ,IAM Challenges ,Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management [5Hrs]

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(Specialization in AI & Machine Learning).

Subject Code	Cloud Computing	L = 2	T = 0	P = 0	Credits = 2
IT 232124	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

UNIT IV: Security Management in the Cloud: **CO4**

Security Management Standards, Security Management in the Cloud, Availability Management: SaaS, PaaS, IaaS

Privacy Issues: Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy,ChangestoPrivacyRiskManagementandComplianceinRelationtoCloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations [5Hrs]

UNIT V: Audit and Compliance: **CO5**

Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a-Cloud.

Advanced Topics Recent developments in hybrid cloud and cloud security. [5Hrs]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Cloud Computing Explained:Im Plementati on Handbook for Enter prises	John Rhoton	Kindle	Recursive Press, 2009,
2	Cloud Computing: A Practical Approach	Velte, Anthony Vote and Robert Elsenpeter	2nd	McGraw Hill, 2002
3.	Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance	Tim Matherm, Subra Kumaraswamy,	1st	O'Reilly Media, 2005

ReferenceBooks:

S. No.	Title	Authors	Edition	Publisher
1	Cloud Application Architectures: Building Applications and Infrastructures in the Cloud	George Reese	1st	O'Reilly Media, 2003
2	Cloud Security and Privacy : An Enterprise Perspectiveon Risksand compliance	TimMather	2nd	O'ReillyMedia, Sept mber2009

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SCHEME OF EXAMINATION AND SYLLABUS

First Year (1st semester) M. Tech. [IT]

(Specialization in AI & Machine Learning).

Subject Code	AI-Principles and Techniques Lab	L = 0	T = 0	P = 3	Credits = 3
IT 232191	ESE	CT	TA	Total	ESE Duration
	75	-	75	150	3 Hours

Course Objective	Course Outcomes
1. To provide students with a theoretical and practical base in Artificial Intelligence. 2. Students will be able purse their study in advanced functional programming. 3. Students will able to Design, Implement, and Analyze simple problem solving technique. 4. Students will able to identify, formulate, and solve problems..	On successful completion of course, student will be able to **CO1:-** Able to understanding of the major areas and challenges of AI **CO2:-**Ability to apply basic AI algorithms to solve problems **CO3:-**Able to describe search strategies and solve problems by applying a suitable search method. **CO4:-**Able to describe and apply knowledge representation.

AI Lab List of Experiments

1. Write a program to implementation of DFS
2. Write a program to implementation of BFS
3. Write a Program to find the solution for traveling salesman Problem
4. Write a program to implement Simulated Annealing Algorithm
5. Write a program to find the solution for campus world problem
6. Write a program to implement 8 puzzle problem
7. Write a program to implement Tower of Hanoi problem
8. Write a program to implement A* Algorithm
9. Write a program to implement Hill Climbing Algorithm

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Logic & prolog programming	Ivan Bratko		
2	Introduction to Turbo Prolog	Carl Townsend		

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Programming in PRLOG	W.F. Clocksin & Mellish		Narosa Publication House

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SCHEME OF EXAMINATION AND SYLLABUS

First Year (1st semester) M. Tech. [IT]

(Specialization in AI & Machine Learning).

Subject Code	Advance Data Structures Laboratory	L = 0	T = 0	P = 3	Credits = 3
IT 232192	ESE	CT	TA	Total	ESE Duration
	75	-	75	150	3 Hours

Course Objective	Course Outcomes
1. The student will be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem. 2. Students will be able to understand the necessary mathematical abstraction to solve problems 3. To familiarize students with advanced paradigms and data structure used to solve algorithmic problems. 4. Student will be able to come up with analysis of efficiency and proofs of correctness. 5. Student will be able to understand Computational Geometry.	On successful completion of course,student will be able to **CO1:-**Understand the implementation of symbol table using hashing techniques **CO2:-**Develop and analyze algorithms forred-blacktrees,B-trees and Splay trees. **CO3:-**Develop algorithms for text processing applications. **CO4:-**Identify suitable data structure sand develop algorithms for computational geometry problems. **CO5:-** Apply Two-Dimensional Range Searching

List of Experiments

1. Simulation and Implementation of hash function
2. Simulation and Implementation of Collision Resolution Techniques in Hashing
3. Simulation and Implementation Double Hashing, Rehashing
4. Simulation and Implementation of Searching Algorithms viz. Divide &Conquer, Greedy etc.
5. Simulation and Implementation Binary Search Trees.
6. Simulation and Implementation AVL Trees.
7. Simulation and Implementation B-Tree.
8. Simulation and Implementation The Knuth-Morris-Pratt Algorithm
9. Simulation and Implementation constructing Priority Search Tree
10 Simulation and Implementation Applying Dynamic Programming to the LCS Problem

List of Tools Required:

IDE

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Data Structures and Algorithms: Concepts - Techniques and Applications	Thomas H. Cormenetal		Tata Mc Graw Hill

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SCHEME OF EXAMINATION AND SYLLABUS

First Year (2nd semester) M. Tech. [IT]

(Specialization in AI & Machine Learning).

Subject Code	Internet of Things	L = 3	T = 1	P = 0	Credits = 4
IT 232201	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To Introduce architecture and Design principal of IOT . 2. To study about Elements of IoT. 3. Discuss on Solution framework for IoT applications. 4. Discuss on IoT reference layer and various protocols and software. 5. Make the students to apply IoT data for business solution in various domain in secured manner.	The students would be able to: **CO1:-** to design and Build architecture of IoT. **CO2**: - Build schematic for IoT solutions. **CO3**:- Design and develop IoT based sensor systems. **CO4**:- Evaluate the wireless technologies for IoT. **CO5:-** Develop logic to design mini projects based on Industrial automation, Transportation, Agriculture

UNIT I: Introduction to IoT:- CO1

Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role of Cloud in IoT, Security aspects in IoT. [5Hrs]

UNIT II: Elements of IoT:- CO2

Characteristics IoT sensor nodes, Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP. [4Hrs]

UNIT III: IoT Application Development:- CO3

Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices. [4Hrs]

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Subject Code	Internet of Things	L = 3	T = 1	P = 0	Credits = 4
IT 232201	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

UNIT IV: IoT security:- **CO4**

Need for encryption, standard encryption protocol, light weight cryptography, Quadruple Trust Model for IoT-A – Threat Analysis and model for IoT-A, Cloud security [4Hrs]

UNIT V : IoT Case Studies :- **CO5**

IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation. IoT for smart cities, health care, agriculture, smart meters. M2M, Web of things. [4Hrs]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Enabling things to talk – Designing IoT solutions with the IoT Architecture Reference Model	Alessandro Bassi, Martin Bauer, Martin Fiedler	First edition	--
2	From Machine to Machine to Internet of Things	Jan Holler, Vlasios Tsiatsis, Catherine Mulligan.	2014 Edition	Elsevier Publications, 2014

ReferenceBooks:

S. No.	Title	Authors	Edition	Publisher
1	The Internet of Things: From RFID to the Next-Generation Pervasive Network	LuYan, Yan Zhang, Laurence T. Yang, Huansheng Ning	2nd edition	Aurbach publications, March,2008
2	Internet of Things A Hands-on-Approach	Vijay Madisetti , Arshdeep Bahga	--	--
3.	Internet of Things	Jeeva Jose	2nd edition	Khanna Publishing House, Delhi

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SCHEME OF EXAMINATION AND SYLLABUS

First Year (2nd semester) M. Tech. [IT]

(Specialization in AI& Machine Learning).

Subject Code	Big Data Analytics	L = 3	T = 1	P = 0	Credits = 4
IT 232202	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. Understand the Big Data Platform and its Use cases 2. Provide an overview of Apache Hadoop & Provide HDFS Concepts and Interfacing with HDFS 3. Understand Map Reduce Jobs 4. Provide hands on Hodoop Eco System 5. Apply analytics on Structured, Unstructured Data.	The students would be able to: **CO1:-** Identify Big Data and its Business Implications. **CO2: -** List the components of Hadoop and Hadoop Eco-System &Manage Job Execution in Hadoop Environment **CO3:-** Access and Process Data on Distributed File System **CO4:-** Develop Big Data Solutions using Hadoop Eco System **CO5:-** Analyze Infosphere BigInsights Big Data Recommendations.

UNIT I: Introduction to Big Data:- CO1

Big Data Overview - State of the practice in analytics - Distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data applications. The role of the Data Scientist - Big Data Analytics in Industry Verticals, Big data sources. Key roles for a successful analytic project - Main phases of the lifecycle - Developing core deliverables for stakeholders. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce. [5Hrs]

UNIT II: Overview of Hadoop:- CO2

History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets. The Distributed File System: HDFS, GPFS – The Design of HDFS – HDFS Concepts- Blocks Name Nodes and Data Nodes Components of Hadoop- Hadoop Cluster Architecture- Batch Processing- Serialization - Hadoop ecosystem of tools-NoSQL . [4Hrs]

UNIT III: Map Reduce Framework, Formats and Features:- CO3

Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features. [4Hrs]

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First Year (2nd semester) M. Tech. [IT]

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Subject Code	Big Data Analytics	L = 3	T = 1	P = 0	Credits = 4
IT 232202	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

UNIT IV: Hadoop Eco System: Pig:- **CO4**

Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.

Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.

Hbase :HBasics, Concepts, Clients, Example, Hbase Versus RDBMS.

Big SQL : Introduction [4Hrs]

UNIT V : Case Study:- **CO5**

Analytics applied in Customer Behavior-Spending Patterns- Banking Transactions-Insurance- Product Portfolio- Credit Information-Health Care- and Retail. [4Hrs]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Hadoop, the Definitive guide‖	Tom White	Third **Edition**	O'Reilly Media, 2012.
2	Big Data Analytics	Seema Acharya, Subhasini Chellappan	Second Edition, Kindle Edition	Wiley 2015
3.	Intelligent Data Analysis	Michael Berthold, David J. Hand	First edition	Springer, 2007

ReferenceBooks:

S. No.	Title	Authors	Edition	Publisher
1	Big Data Analytics with R and Haoop	Vignesh Prajapati	2013 Edition	Packet Publishing 2013
2	Big Data and Business Analytics	Jay Liebowitz	First edition	Auerbach Publications, CRC press (2013)

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First Year (2nd semester) M. Tech. [IT]

(Specialization in AI& Machine Learning).

Subject Code	Machine Learning Techniques	L = 3	T = 1	P = 0	Credits = 4
IT 232203	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1.To introduce students to the basic concepts and techniques of Machine Learning. 2.To develop skills of using recent machine learning software for solving practical problems. 3.To understand and compare various Machine Learning Algorithms. 4.To study supervised and unsupervised learning paradigms of machine learning. 5.To study and understand various clustering models.	The students would be able to: **CO1**:- Recognize the characteristics of machine learning that make it useful to real-world problems. **CO2**: - Characterize machine learning algorithms as supervised, semi-supervised, and unsupervised. **CO3**:- Effectively use machine learning toolboxes. **CO4**:- Understand the concept behind neural networks for learning non-linear functions. **CO5**:- Understand the inference and learning algorithms for the hidden Markov model.

UNIT I: Introduction :- CO1

Definition of learning systems. Goals and applications of machine learning, History of Machine Learning, Programs vs learning algorithms, Machine Learning definition, Components of a learning, Different Types of Learning Concept Learning Task. [5Hrs]

UNIT II: Artificial Neural Networks:- CO2

Artificial Neural Networks, Perception, Multilayer networks and Back-propagation algorithm, Introduction to Deep Neural networks, Recurrent Neural Networks (RNNs) and Convolution Neural Networks (CNNs)Evaluating Hypotheses, Basics of sampling theory, comparing learning algorithms Bayesian learning and Bayesian networks. [4Hrs]

UNIT III: Supervised Learning :- CO3

Decision Trees, Basic decision trees learning algorithm, inductive bias in decision tree learning and over-fitting, Distance-based method, Nearest-Neighbours, Gibbs algorithm, EM algorithm, Naive Bayes classifier. [4Hrs]

Subject Code	Machine Learning Techniques	L = 3	T = 1	P = 0	Credits = 4
IT 232203	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

UNIT IV: Instance –Based Learning and Support Vector Machines:- **CO4**

Instance based learning, K-Nearest-Neighbor, Locally weighted linear Regression, Logistic Regression, SVM, Multiclass & Ordinal Classification, Kernel Methods. [4Hrs]

UNIT V : Unsupervised Learning:- **CO5**

Clustering, Generative Models, Mixture Models , Hidden Markov Model, Genetic Algorithms, Introduction to Analytical Learning, Combining Inductive and Analytical learning, Reinforcement learning, adaptive hierarchical clustering, Gaussian mixture model. [4Hrs]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Machine Learning	Mitchell Tom	1997 Edition	McGraw Hill, 1997
2	Introduction to Machine Learning	Ethem Alpaydin	Third edition	PHI
3.	Pattern Recognition and Machine Learning	Chris Bishop	edition	---

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	The Elements of Statistical Learning Data Mining, Inference, and Prediction	Trevor Hastie, Robert Tibshirani, Jerome Friedman	Second Edition	February 2009
2	Course material available on Swayam platform and NPTEL, for the course on Introduction to Machine Learning, conducted	Prof. Sudeshna Sarkar, IIT Kharagpur	February 2009.	Auerbach

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(Specialization in AI& Machine Learning).

Subject Code	Information Security Techniques	L = 3	T = 1	P = 0	Credits = 4
IT 232204	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1.To understand the basic concepts of Information security model. 2.To study the Basic Concepts & Principles of Cryptography. 3.To study the basic knowledge of watermarking. 4.To know the IP security architecture and Internet Key Exchanging (IKE). 5.To understand the Security System for Information**.**	After the completion of course, Student will be able to **CO1**:- To design the basic concepts of Information Security Model. **CO2: -** To encrypt and Decrypt problem through different Encryption and Decryption Techniques. **CO3:**- To handle Internet Security through IP Security Architecture. **CO4:-** To understand and design a Watermarking System. **CO5**:- To design the Information Security System and able to resolve Virus and related Threats.

UNIT I: Introduction to Information Security:- CO1

Securing Information, Information security model, Data to information, Information systems & movement, Information management. Information security model & techniques, Information security planning, Attacks, Security planning & Policy creation, Education & Management.

Overview of Cryptography : Basic Concepts & Principles of Cryptography, Crypt Analysis: Substitution Techniques, Caesar Cipher, Modified Version of Caesar Cipher, Mono-alphabetic Cipher, Homophonic & Polygram Substitution Cipher, Polyalphabetic, Playfair ,Transposition Techniques: Rail-Fence Techniques, Simple Columnar, Vernam, Book Cipher, Systematic Cipher Model, Stegnography Techniques. [5Hrs]

UNIT II: Key Management:- CO2

Introduction to Number Theory, Elliptic Curve Arithmetic, Symmetric key Cryptography: Block cipher design, Principles and criteria, DES, IDEA, AES. Blowfish. Asymmetric key Cryptography: Principles of Public key cryptosystems, RSA algorithm, Deffi- Hellman key exchange algorithm.. [4Hrs]

UNIT III: Watermarking & Watermark Security:- CO3

Limitations, Threads, and Impacts on the Digital Age, Concept of Watermarking, Requirements ,Types & Properties of Watermarking & Watermarking Systems, Models of Watermarking, Different Techniques of Watermarking, Applications. [4Hrs]

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(Specialization in AI& Machine Learning).

Subject Code	Information Security Techniques	L = 3	T = 1	P = 0	Credits = 4
IT 232204	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

UNIT IV: Internet security:- **CO4**

Secure Sockets, IP Security Overview, IP Security Architecture, Internet Key Exchanging (IKE), IKE phases, Encoding, Internet Security, Threats to Privacy, Packet Sniffing, Spoofing, Web security Requirements Real Time Communication Security, Security Standard- Kerberos, Authentication Services

[4Hrs]

UNIT V : Information System Security : **CO5**

Physical Security, Application & File Protection, System Security, Network Security, Intrusion Detection, Web Security: Web Security Consideration , Secure Socket Layer .Secure Electronic Transaction(SET), Smart Card Based Systems, Virus and Related Threats , Virus Counter Measures, Firewall Design Principles. [4Hrs]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Cryptography and Network Security	William Stalling	Third edition	PHI
2	Information Security Intelligence: Cryptography Principles & Applications	Thomas Calabrese	Third edition	PHI

ReferenceBooks:

S. No.	Title	Authors	Edition	Publisher
1	Applied Cryptography: Protocols & Algorithms	Schneier & Bruce	Second edition	
2	Cryptography & N/w Security		Third edition	Atul Kaha

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SCHEME OF EXAMINATION AND SYLLABUS

First Year (2nd semester) M. Tech. [IT]

(Specialization in AI& Machine Learning).

Subject Code	Intelligent Information Retrieval	L = 3	T = 1	P = 0	Credits = 4
IT 232221	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1.To Define the fundamentals of information retrieval (IR) 2.Study of indexing, search, relevance, classification, organization, storage, browsing, visualization 3.To Learn about different Retrieval Models 4.To Learn and evaluate Retrieval performance. 5.To Explain Research and practical retrieval technologies both on World Wide Web.	The students would be able to: 1.Understand Information Retrieval and its Implications. 2.Access and Process Data using indexing, classification and clustering techniques 3.Understand information Retrieval Models 4.Analyze the performance of an Information Retrieval system by applying the proper evaluation measures. 5.Design and develop (Web) Information Retrieval systems.

UNIT I: Introduction to Information Retrieval: CO1

Overview of IR Systems, Historical Perspectives, Models of Information Retrieval, Retrieval Evaluation. [5Hrs]

UNIT II: Document Indexing and Analysis: CO2

Document Representation: Statistical Characteristics of Text, Basic Query Processing. Data Structure and File Organization for IR. Automatic Indexing and Indexing Models. [4Hrs]

UNIT III: Information Retrieval Models: CO3

Retrieval Models: Similarity Measures and Ranking, Boolean Matching, Vector Space Models, Probabilistic Models [4Hrs]

Subject Code	Intelligent Information Retrieval	L = 3	T = 1	P = 0	Credits = 4
IT 232221	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

UNIT IV: Clustering in Information Retrieval: CO4

Search and Filtering Techniques: Relevance Feedback, User Profiles, Collaborative Filtering. Document and Term Clustering, Document Categorization. [4Hrs]

UNIT V: Information Retrieval on the World Wide Web: CO5

IR Systems and the WWW, Page Rank and Hyperlink Analysis, Search Personalization, Intelligent Web Agents, Web Mining and Its Applications. [4Hrs]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Introduction to Information Retrieval,	Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze,	Third edition	Cambridge University Press. 2008.
2	Mining the Web, Discovering Knowledge from Hypertext Data	Soumen Chakrabarti.	Second edition	--

ReferenceBooks:

S. No.	Title	Authors	Edition	Publisher
1	Information Retrieval lgorithmsand Heuristics	Grossman, David A and FRIEDER OPHIR	Third edition	---

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SCHEME OF EXAMINATION AND SYLLABUS

First Year (2nd semester) M. Tech. [IT]

(Specialization in AI& Machine Learning).

Subject Code	Research Methodology & IPR	L = 3	T = 1	P = 0	Credits = 4
IT 232222	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To study about research problems. 2. To aware students about different approaches of investigation of solutions for research problem. 3. To understand about Effective Technical Writing 4. To Know about Intellectual Property 5. To Understand the details of Patent and about the New Developments in IPR:	After the completion of subject, The students would be able to: 1. Follow research Ethics 2. Analyze research related information 3. Write Technical Articles Effectively. 4. Understanding the details of Patent. 5. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D for growth and social benefits.

UNIT I: Research Problem :- CO1

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations. [5Hrs]

UNIT II: Effective Technical Writing :- CO2

Effective literature studies approaches, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee. [4Hrs]

UNIT III: Intellectual Property:- CO3

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT. [4Hrs]

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UNIT IV: Patent:- CO4

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information And databases. Geographical Indications. [4Hrs]

UNIT V: New Developments in IPR:- CO5

Introduction: Administration of Patent System. IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs [4Hrs]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Research methodology: an introduction for science & engineering students	Stuart Melville and Wayne Goddard	Third edition	Juta & Co Ltd Pages: 167
2	Research Methodology: An Introduction	Wayne Goddard and Stuart Melville	Third edition	Lansdowne
3	Research Methodology: A Step by Step Guide for beginners	Ranjit Kumar	2nd Edition	
4	Resisting Intellectual Property	Halbert	First Edotion	Taylor & Francis Ltd,2007
5	Industrial Design	Mayall	First Edotion	McGraw Hill,1992.

ReferenceBooks:

S. No.	Title	Authors	Edition	Publisher
1	Product Design	Niebel	First Edotion	McGraw Hill,1974.
2	Introduction to Design	Asimov	Second Edotion	Prentice Hall,1962.
3	Intellectual Property in New Technological Age	Robert P. Merges, Peter S. Menell, Mark A. Lemley	Third Edotion	201 6

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SCHEME OF EXAMINATION AND SYLLABUS

First Year (2nd semester) M. Tech. [IT]

(Specialization in AI& Machine Learning).

Subject Code	Wireless Sensor Networks	L = 3	T = 1	P = 0	Credits = 4
IT 232223	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To understand the fundamentals of wireless sensor networks and its application tocritical real time scenarios. 2. To learn the basics and Architecture of Sensors 3. To study the various protocols at various layers and its differences with traditional protocols. 4. To understand the issues pertaining to sensor networks and the challenges involved in managing a sensor network. 5. To design Hard ware part of sensor Networks	Student will be able to understand: **CO1**:- How to build a WSN network **CO2**: - Able to design, develop, and carry out performance analysis of sensors on specific applications **CO3**:- Analysis of various critical parameters in deploying a WSN **CO4**:- Able to design & implement hardware part of sensor networks **CO5**:- To explore and implement solutions to real world problems using sensor devices, enumerating its principles of working

UNIT I: Introduction :- CO1

Fundamentals of wireless communication technology, the electromagnetic spectrum radio propagation, characteristics of wireless channels, modulation techniques, multiple access techniques, wireless LANs, PANs, WANs, and MANs, Wireless Internet. [5Hrs]

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UNIT II::- CO2

Introduction to adhoc/sensor networks: Key definitions of adhoc/ sensor networks, unique constraints and challenges, advantages of ad-hoc/sensor network, driving applications, issues in adhoc wireless networks, issues in design of sensor network, sensor network architecture, data dissemination and gathering. [4Hrs]

UNIT III: MAC Protocols:- CO3

Issues in designing MAC protocols for adhoc wireless networks, design goals, classification of MAC protocols, MAC protocols for sensor network, location discovery, quality, other issues, S-MAC, IEEE 802.15.4. [4Hrs]

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Subject Code	Wireless Sensor Networks	L = 3	T = 1	P = 0	Credits = 4
IT 232223	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

UNIT IV: Routing Protocols:- **CO4**

Issues in designing a routing protocol, classification of routing protocols, table-driven, on-demand, hybrid, flooding, hierarchical, and power aware routing protocols. [4Hrs]

UNIT V: Hardware design & Applications of sensor Networks:- **CO5**

Characteristics – Design challenges- Design of Architecture- Functional components- Energy supply- operating system. Application: Underwater sensor networks. Real life deployment of WSN- Development of sensor based networking for improved management of irrigated crops - usage of sensors on medical devices (like accelerometer and gyroscope) and study of their performance. QoS and Energy Management.

[4Hrs]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	AdHoc Wireless networks	C. Siva Ram Murthy, and B. S. Manoj	Second Edition	Pearson Education - 2008
2	Protocols and Architectures for Wireless Sensor Network	Holger Kerl, Andreas Willig	Third Edition	John Wiley and Sons, 2005
3.	Wireless Sensor Network	Raghavendra, Cauligi S, Sivalingam, Krishna M., ZantiTaieb	Second Edition	Springer 1st Ed. 2004

ReferenceBooks:

S. No.	Title	Authors	Edition	Publisher
1	Wireless sensor networks	Feng Zhao and Leonides Guibas	First Edition	Elsevier publication - 2004
2	Mobile Communications	Jochen Schiller	2nd Edition, 2003	Pearson Education

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First Year (2nd semester) M. Tech. [IT]

(Specialization in AI& Machine Learning).

Subject Code	Computer Vision	L = 3	T = 1	P = 0	Credits = 4
IT 232224	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1.To introduce the students the fundamentals of image formation. 2.To introduce the students the major ideas, methods and techniques of image processing. 3.To develop an appreciation for various issues in design of computer vision. 4.To develop an appreciation for various issues in design of object recognition. 5.To introduce the major ideas and techniques of pattern recognition. .	After learning the course the students should be able to: **CO1:-** To implement fundamental image processing techniques required for computer vision **CO2:** - Understand Image formation process **CO3:-** To perform shape analysis **CO4:-** Extract features form Images and do analysis of Images **CO5:-** Generate 3D model from images

UNIT I: Introduction :- CO1

Image Processing, Computer Vision and Computer Graphics , What is Computer Vision - Low-level, Mid-level, High-level , Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality.

Image Formation Models : Monocular imaging system , Radiosity: The 'Physics' of Image Formation, Radiance, Irradiance, BRDF, color etc, Orthographic & Perspective Projection,• Camera model and Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination, shape from shading , Photometric Stereo, Depth from Defocus , Construction of 3D model from images.

[5Hrs]

UNIT II: Image Processing & Motion Estimation: Image Processing and Feature Extraction:- CO2

Image Processing, Image representations (continuous and discrete) , Edge detection.

Motion Estimation: Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion. [4Hrs]

UNIT III: Image Representation & Segmentation: Shape Representation and Segmentation:- CO3

Contour based representation, Region based representation, Deformable curves and surfaces , Snakes and active contours, Level set representations , Fourier and wavelet descriptors , Medial representations, Multiresolution analysis. [4Hrs]

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First Year (2nd semester) M. Tech. [IT]

(Specialization in AI& Machine Learning).

Subject Code	Computer Vision	L = 3	T = 1	P = 0	Credits = 4
IT 232224	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

UNIT IV: Object Recognition:- **CO4**

Hough transforms and other simple object recognition methods, Shape correspondence and shape matching Principal component analysis , Shape priors for recognition [4Hrs]

UNIT V : Pattern Recognition & Understanding: Image Understanding:- **CO5**

Pattern recognition methods, HMM, GMM and EM. **Applications**: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters –Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians [4Hrs]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Computer Vision - A modern approach	D. Forsyth and J. Ponce	First Edotion	McGraw-Hill
2	Introductory Techniques for 3D Computer Vision	E. Trucco and A. Verri	2nd Edotion	Prentice Hall
3.	Digital Image Processing	R. C. Gonzalez, R. E. Woods	3rd Edotion	Addison Wesley Longman, Inc., 1992.

ReferenceBooks:

S. No.	Title	Authors	Edition	Publisher
1	Computer Vision: Algorithms and Applications (CVAA)	Richard Szeliski	2nd Edotion	Springer, 2010
2	Computer & Machine Vision	E. R. Davies	Fourth Edition,	Academic Press, 2012
3.	Computer Vision: Models, Learning, and Inference	Simon J. D. Prince	3rd Edotion	Cambridge University Press, 2012

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First Year (2nd semester) M. Tech. [IT]

(Specialization in AI & Machine Learning).

Subject Code	Internet of Things Lab	L = 0	T = 0	P = 3	Credits = 3
IT 232291	ESE	CT	TA	Total	ESE Duration
	75	-	75	150	3 Hours

Course Objective	Course Outcomes
1. Introduce cloud computing and enabling technologies 2. Explore the need for fog and edge computation 3. Impart the knowledge to log the sensor data and to perform further data analytics. 4. Perform data pushing and processing in commercial clouds. 5. Understand edge computation.	At the end of the course student will be able to CO1:- Deploy their data in the cloud for simple applications. CO2:- Apply the analytics in cloud to extract information. CO3:- Appreciate and deploy fog data processing layers. CO4:- Integrate sensor data to cloud through fog computation layers. CO5:- Understand and implement edge computation. CO6:- Develop edge analytics using python and tensor flow.

List of Experiments

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
6. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.
7. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thing speak cloud.
8. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thing speak cloud.
9. To deploy their data in the cloud for simple applications.
10. To Apply the analytics in cloud to extract information
11. To install MySQL database on Raspberry Pi and perform basic SQL queries.
12. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
13. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
14. Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.
15. Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Internet of Things	Vijay Madisetti, Arshdeep Bahga	2nd Edotion	A Hands on Approach", University Press
2	Introduction to Internet of Things: A practical Approach	Dr. SRN Reddy, Rachit Thukral and Manasi Mishra	Fourth edition	ETI Labs
3	The Internet of Things: Enabling Technologies, Platforms, and Use Cases	Pethuru Raj and Anupama C. Raman	Second edition	CRC Press

Reference Books :

S.No.	Title	Authors	Edition	Publisher
1	Designing the Internet of Things	Adrian McEwen	3rd Edotion	Wiley
2	Internet of Things: Architecture and Design	Raj Kamal	Fourth edition	McGraw Hill
3	Getting Started with the Internet of Things	Cuno Pfister	First edition	O Reilly Media

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SCHEME OF EXAMINATION AND SYLLABUS

First Year (2nd semester) M. Tech. [IT]

(Specialization in AI & Machine Learning).

Subject Code	Machine Learning Techniques Lab	L = 0	T = 0	P = 3	Credits = 3
IT 232292	ESE	CT	TA	Total	ESE Duration
	75	-	75	150	3 Hours

Course Objective	Course Outcomes
1.Make use of Data sets in implementing the machine learning algorithms. 2.Implement the machine learning concepts and algorithms in any suitable language of choice 3.Implement supervised and unsupervised learning techniques. 3. Implement the various clustering models. 5.To study and understand various clustering models.	At the end of the course student will be able to CO1:- Deploy their data in the cloud for simple applications. CO2:- Apply the analytics in cloud to extract information. CO3:- Appreciate and deploy fog data processing layers. CO4:- Integrate sensor data to cloud through fog computation layers. CO5: -Understand and implement edge computation. CO6:-Develop edge analytics using python and tensor flow. CO7:Perform data pushing and processing in commercial clouds.

List of Experiments

1. 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 CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output adscription of the set of all hypotheses consistent with the training examples.
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. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
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 datasets.
6. Assuming asset of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your dataset.
7. 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 Java/Python ML library classes/API.
8. 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 Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Machine Learning	Tom M. Mitchell	2nd edition	McGraw-Hill Education (India) Private Limited, 2013
2	Introduction to Machine Learning (Adaptive Computation and Machine Learning)	Ethem Alpaydin	Third Edition	The MIT Press 2004

Reference Books :

S.No.	Title	Authors	Edition	Publisher
1	The Elements of Statistical Learning Data Mining, Inference, and Prediction	Trevor Hastie, Robert Tibshirani, Jerome Friedman	Third Edition	PHI
2	Pattern classification	Richard O. Duda, Peter E. Hart, David G. Stork	2001 edition	Wiley, New York, 2001

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