SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		VI/III		Program			B.Tech – Artificial Intelligence and Data Science				
Subject Category	DC	Subject Code:		AI 601	Subject Name		Data Mining and Data Warehousing				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

1. To provide students with knowledge, advanced skills and understanding of Data Warehousing.
2. Its components, design principles and modelling.
3. Provide students with in-depth concepts in knowledge discovery.
4. Data mining, different data mining algorithms and classification techniques.

UNITs	Descriptions	Hrs.
I	**Data Warehousing:** Introduction to Data warehousing, needs for developing data Warehouse, Data warehouse systems and its Components, Design of Data Warehouse, Dimension and Measures, Data Marts:-Dependent Data Marts, Independents Data Marts and Distributed Data Marts, Conceptual Modelling of Data Warehouses, Star Schema, Snowflake Schema, Fact Constellations. Multidimensional Data Model and Aggregates.	8
II	Characteristics of OLAP System, Motivation for using OLAP, Multidimensional View and Data Cube, Data Cube Implementations, Data Cube Operations, Guidelines for OLAP Implementation, Difference between OLAP and OLTP, OLAP Servers: ROLAP, MOLAP, HOLAP Queries.	8
III	Introduction to Data Mining, Knowledge Discovery, Data Mining Functionalities, Data Mining System categorization and its Issues. Data Processing: Data Cleaning, Data Integration and Transformation. Data Reduction, Data Mining Statistics, Guidelines for Successful Data Mining.	8
IV	Introduction, Basic, The Task and a Naïve Algorithm, Apriori Algorithms, Improving the efficiency of the Apriori Algorithm, Apriori-Tid, Direct Hasing and Pruning (DHP), Dynamic Itemset Counting (DIC), Mining Frequent Patterns without Candidate Generation (FP-Growth), Performance Evaluation of Algorithms.	8
V	Introduction, Decision Tree, The Tree Induction Algorithm,Split Algorithms Based on Information Theory, Split Algorithm Based on the Gini Index, Overfitting and Pruning, Decision Trees Rules, Naïve Bayes Method. Cluster Analysis: Introduction, Desired Features of Cluster Analysis, Types of Cluster Analysis Methods: Partitional Methods, Hierarchical Methods, Density- Based Methods, Dealing with Large Databases, Quality and Validity of Cluster Analysis Methods	8
Total Hours		45

Course Outcomes:

CO1: Explain the functionality of the various data warehousing models and components.
CO2: Apply data pre- processing techniques on different datasets.
CO3: Evaluate the performance of different association rules and classification techniques.
CO4: Compare different association rule mining techniques.
CO5: Identify different advance Classification and Clustering data mining techniques.

Text Book

Text Book-

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Elsevier Pub.

Reference Books-

1 Arun K. Pujari, “Data Mining Techniques”, University Press.
2. Berson, “Data Warehousing and Data Mining and OLAP”, TMH

List and Links of e-learning resources:

- https://ocw.mit.edu/
- www.weka.com

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

1. Installation of WEKA Tool. CO1
2. Creating new Arff File. CO1
3. Data Processing Techniques on Data set. CO2
4. Data cube construction – OLAP operations. CO1
5. Implementation of Apriori algorithm. CO4
6. Implementation of FP- Growth algorithm. CO4
7. Implementation of Decision Tree Induction. CO3
8. Calculating Information gains measures. CO3
9. Classification of data using Bayesian approach. CO5
10. Implementation of K-means algorithms. CO5

Case Study: Create Placement.arff file to identify the students who are eligible for placements using KNN. CO5

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Prof. Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		VI/III		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	DC	Subject Code:		AI 602	Subject Name	Machine Learning				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To become familiar with regression methods, classification methods, clustering methods.
3. To become familiar with Dimensionality reduction Techniques.

UNITs	Descriptions	Hrs.
I	Definition of learning systems. Goals and applications of machine learning. designing a learning system: training data, concept representation, function approximation. well posed learning problems, perspective & issues in machine learning ,The concept learning task. Concept learning as search through a hypothesis space. General-to-specific ordering of hypothesis. FIND-S ,candidate elimination algorithm	8
II	Introduction, Decision tree representation, appropriate problems for decision tree learning, basic decision tree algorithm, hyperspace search in decision tree learning, issues in decision tree learning. Probability theory and Bayes rule. Naive Bayes learning algorithm	10
III	Parameter smoothing. Generative vs. discriminative training. Logistic regression. Bayes nets and Markov nets for representing dependencies. Introduction, K-nearest neighbour learning, case-based learning, radial basis functions.	12
IV	Learning from unclassified data. Clustering. Hierarchical Agglomerative Clustering. k-means partitional clustering. Expectation maximization (EM) for soft clustering. Semi-supervised learning with EM using labelled and unlabelled data.	8
V	Introduction, neural network representation , problems for neural network learning, perceptron's, multilayer network & Back propagation Algorithm. Introduction, genetic operators, genetic programming, models of evolution & learning, parallelizing genetic algorithm. .	7
Total Hours		45

Course Outcomes:

CO-1: Gain knowledge about basic concepts of Machine Learning.
CO-2: Identify machine learning techniques suitable for a given problem
CO-3: Solve the problems using various machine learning techniques
CO-4: Apply Dimensionality reduction techniques.
CO-5: Design application using machine learning techniques

Text Book

1. Tom M. Mitchell. "Machine Learning" McGraw-Hill, 2297.

Reference Books-

1. P. Langley. "Elements of Machine Learning" Morgan Kaufmann Publishers, Inc. 2296.

2. Ethem Alpaydin "Introduction to machine learning ".Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Universities Press.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/106/106106131/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive 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 a .CSV file. CO1
2. 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.CO1
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.CO2
4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.CO3
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.CO3
6. Assuming a set 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 data set.CO3
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.CO2
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. CO4
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. CO5
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Selectappropriate data set for your experiment and draw graphs. CO5

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		V/III		Program		B.Tech – Artificial Intelligence and Data Science
Subject Category	DE-II	Subject Code:	AI 603A	Subject Name		Artificial Intelligence

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

1 Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
2 Review of classical problem solving: search and forward and backward chaining.
3 Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem etc.

UNITs	Descriptions	Hrs.
I	Definitions – Foundation and History of AI, Evolution of AI - Applications of AI, Classification of AI Systems with respect to environment. Artificial Intelligence vs Machine learning, Tic - Tac – Toe problem. Intelligent Agent: Concept of Rationality, nature of environment, structure of agents.	8
II	Heuristic Search Techniques: Generate-and-Test; Hill Climbing; Properties of A* algorithm, Best first Search; Problem Reduction. Constraint Satisfaction problem: Interference in CSPs; Back, tracking search for CSPs; Local Search for CSPs; structure of CSP Problem. Beyond Classical, Search: Local search algorithms and optimization problem, local search in continuous spaces, searching with nondeterministic action and partial observation, online search agent and unknown environments.	8
III	Game playing – Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic- Structured representation of knowledge	8
IV	Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques. Natural Language Processing Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing.Hopfield Network, Learning in Neural Networks, Application of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI and Symbolic AI.	8
V	Development Process, knowledge Acquisition. PROLOG Introduction, Syntax and Numeric Function, Basic List Manipulation, Functions, Predicates and Conditional, input, output and Local Variables, iteration and Recursion, Property Lists and Arrays, LISP and other AI Programming Languages.	8
Total Hours		40

Course Outcomes:

CO1: Describe various searching methods and reasoning in AI.
CO2: Uses of Knowledge Representation Techniques.
CO3: Analysis the concepts of reasoning and planning
CO4: Illustrate the concept of NLP and NN
CO5: Apply and evaluate AI Techniques using PROLOG and LISP

Text Book

1. Artificial Intelligence -By Elaine Rich And Kevin Knight (2nd Edition) Tata Mcgraw-Hill Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Universities Press.

Reference Books-

1. Introduction to Prolog Programming By Carl Townsend.
2. Programming with PROLOG —By Klocksin and Mellish.
3. Artificial Intelligence (Fifth Edition) -By George F Luger, Pearson Education.
4. Artificial Intelligence (Second Edition}-By Stuart Russell and Peter Norvig, Pearson Education.
5. Artificial Intelligence Application Programming, Tim Jones, Wiley India
6. Artificial Intelligence And Expert Systems - By D.W Patterson .

List/Links of e-learning resource

List and Links of e-learning resources:

- https://nptel.ac.in/courses/117103063/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

1. Write a program to solve 8 queens problem
2. Solve any problem using depth first search.
3. Solve any problem using best first search.
4. Solve 8-puzzle problem using best first search
5. Solve travelling salesman problem.
6. Write a program to solve the Monkey Banana problem

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		**VI/III**		**Program**		**B.Tech – Artificial Intelligence and Data Science**
Subject Category	**DE-II**	**Subject Code:**		**AI 603(B)**	**Subject Name**	**Knowledge Representation**

Maximum Marks Allotted								**Contact Hours**			**Total Credits**
Theory				**Practical**			**Total Marks**				
ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
60	**20**	**10**	**10**				**100**	**3**	**1**	**0**	**4**

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

UNITs	**Descriptions**	**Hrs.**
I	The Key Concepts: Knowledge, Representation, and Reasoning, Why Knowledge Representation and Reasoning? Knowledge-Based Systems, why knowledge Representation? Why Reasoning? The Role of Logic, Propositional Logic basics, Soundness & Completeness, Resolution Proof, Semantic Tableaux, Binary Decision Diagrams	8
II	The Language of First-Order Logic: Introduction, The Syntax, The Semantics, Interpretations, Denotation, Satisfaction and Models, Logical Consequence Why We Care, Explicit and Implicit Belief, Knowledge-Based Systems. Expressing Knowledge. Knowledge Engineering, Vocabulary, Basic Facts, Complex Fact, Terminological Fact, Entailments, Abstract Individuals, Other Sorts of Facts.	8
III	Resolution: The Propositional Case, Resolution Derivations, An Entailment Procedure, Handling Variables and Quantifiers, First-Order Resolution, Answer Extraction., Skolemization, Equality, Dealing with Computational Intractability, The First-Order Case, The Herbrand Theorem, The Propositional Case , The Implications , SAT Solvers, Most General Unifiers, Other Refinements	8
IV	Reasoning with Horn Clauses: Horn Clauses, Resolution Derivations with Horn Clauses, SLD Resolution, Goal Trees, Computing SLD Derivations, Backward Chaining, Forward Chaining, The First-Order Case.	8
V	Procedural Control of Reasoning: Facts and Rules , Rule Formation and Search Strategy, Algorithm Design, Specifying Goal Order , Committing to Proof Methods , Controlling Backtracking, Negation as Failure Dynamic Databases, The PLANNER Approach.	8
Total Hours		40

Course Outcomes:

CO-1: Express knowledge of a domain formally (Understand)

CO-2: Explain the production systems, frames, inheritance systems and approaches to handle uncertain or incomplete knowledge (Understand).

CO-3: Examine the principles of reasoning (Analyze)

CO-4: Describe how knowledge-based systems work (Understand)

CO-5: Illustrate knowledge-based approaches to problem solving (Apply)

CO-6: Design & develop a knowledge- based system (Create)

Text Book

Text Book-

1. Language, Proof and Logic, Jon Barwise & John Etchemendy, CSLI Publications (1999); 2. Knowledge representation and Reasoning, Ronald J. Brachman & Hector J. Levesque, Elsevier (2004);

Reference Books-

1. The Description Logic Handbook: Theory, implementation, and applications, Franz Baader, Deborah L.
2. McGuinness, Daniele Nardi and Peter F. Patel-Schneider, Cambridge University Press (2010)

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Prof. Ramratan Ahirwal
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		VI/III		Program			B.Tech – Artificial Intelligence and Data Science				
Subject Category	DE-2	Subject Code:		AI 603(C)	Subject Name		Cryptography and Network Security				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	1	-	4

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

This course will provide students with a practical and theoretical knowledge of cryptography and network security.

UNITs	Descriptions	Hrs.
I	Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security, Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.	8
II	Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4. Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm	8
III	Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme. Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – KeyInfrastructure.	8
IV	Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security,HTTPS, Secure Shell (SSH) Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security.	8
V	E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, encapsulating security payload, Combining security associations, Internet Key Exchange Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.	8
Total Hours		40

Course Outcomes:

CO1. Understand cryptography and network security concepts and application

CO2. Apply security principles to system design

CO3. Identify and investigate network security threat

CO4. Analyse and design network security protocols

CO5. Conduct research in network security

Text Book

Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

Reference Books-

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1stEdition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Prof. Ramratan Ahirwal
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		VI/III		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	DE-III	Subject Code:		AI 604(A)	Subject Name	Computer Vision				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	1	0	4

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

Identify basic concepts, terminology, theories, models and methods of computer vision.

Describe basic methods of computer vision related to multi-scale representation.

Understanding edge detection of primitives, stereo, motion and object recognition.

Developed the practical skills necessary to build computer vision applications.

To have gained exposure to object and scene recognition.

UNITs	Descriptions	Hrs.
I	**Data Warehousing:** Introduction to Data warehousing, needs for developing data Warehouse, Data warehouse systems and its Components, Design of Data Warehouse, Dimension and Measures, Data Marts: -Dependent Data Marts, Independents Data Marts and Distributed Data Marts, Conceptual Modelling of Data Warehouses, Star Schema, Snowflake Schema, Fact Constellations. Multidimensional Data Model and Aggregates.	8
II	Characteristics of OLAP System, Motivation for using OLAP, Multidimensional View and Data Cube, Data Cube Implementations, Data Cube Operations, Guidelines for OLAP Implementation, Difference between OLAP and OLTP, OLAP Servers: ROLAP, MOLAP, HOLAP Queries.	8
III	Introduction to Data Mining, Knowledge Discovery, Data Mining Functionalities, Data Mining System categorization and its Issues. Data Processing: Data Cleaning, Data Integration and Transformation. Data Reduction, Data Mining Statistics, Guidelines for Successful Data Mining.	8
IV	Introduction, Basic, The Task and a Naïve Algorithm, Apriori Algorithms, Improving the efficiency of the Apriori Algorithm, Apriori-Tid, Direct Hasing and Pruning (DHP), Dynamic Itemset Counting (DIC), Mining Frequent Patterns without Candidate Generation (FP-Growth), Performance Evaluation of Algorithms.	8
V	Introduction, Decision Tree, The Tree Induction Algorithm,Split Algorithms Based on Information Theory, Split Algorithm Based on the Gini Index, Overfitting and Pruning, Decision Trees Rules, Naïve Bayes Method. Cluster Analysis: Introduction, Desired Features of Cluster Analysis, Types of Cluster Analysis Methods: Partitional Methods, Hierarchical Methods, Density- Based Methods, Dealing with Large Databases, Quality and Validity of Cluster Analysis Methods	8
Total Hours		40

Course Outcomes:

- CO1: Ability to understand the fundamental concepts in computer vision
- CO2: Ability to apply segmentation techniques and descriptors

- CO3: Ability to analyse medical problems using computer vision techniques
- CO4: Ability to evaluate performance of computer vision algorithms in biomedical applications
- CO5: Suggest a design of a computer vision system for a specific problem

Text Book

Text Book-

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Elsevier Pub.

Reference Books-

1 Arun K. Pujari, "Data Mining Techniques", University Press.
2. Berson, "Data Warehousing and Data Mining and OLAP", TMH

List and Links of e-learning resources:

- https://ocw.mit.edu/
- www.weka.com

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

1 Installation of WEKA Tool
2 Creating new Arff File
3 Data Processing Techniques on Data set
4 Data cube construction – OLAP operations
5 Implementation of Apriori algorithm
6 Implementation of FP- Growth algorithm
7 Implementation of Decision Tree Induction
8 Calculating Information gains measures
9 Classification of data using Bayesian approach
10 Implementation of K-means algorithms
11 Case Study: Create Placement.arff file to identify the students who are eligible for placements using KNN

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Prof. Ramratan Ahirwal
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF IT

Semester/Year	**IV/II**	**Program**	**B.Tech – AIADS**
Subject Category	**DE-3**	**Subject Code:**	**AI 604(B)**	**Subject Name**	**Introduction to IoT**

Maximum Marks Allotted								**Contact Hours**			**Total Credits**
Theory				**Practical**			**Total Marks**				
ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
60	**20**	**10**	**10**	**-**	**-**	**-**	**100**	**3**	**1**	**0**	**4**

Prerequisites:

NA

Course Objective:

- To make students know the IoT ecosystem.
- To provide an understanding of the technologies and the standards relating to theInternet of Things.
- To develop skills on IoT technical planning.

UNITs	**Descriptions**	**Hrs.**
I	Introduction & concepts: definition and characteristics of IoT, physical design of IoT, Logical Design of IoT, IoT enabling technologies, IoT levels and development templates, IoT and M2M, IoT design Methodology.	8
II	IoT Networking: Connectivity Technologies, Gateway Prefix Allotment, Impact of Mobility on Addressing, Multihoming, Deviations from Regular Web, IoT identification and Data Protocols(IPv4, IPv6, MQTT, CoAP, XMPP and AMQP)	8
III	Connectivity Technologies: Introduction, IEEE 802.15.4, ZigBee, 6LoWPAN, RFID, HART and Wireless HART, NFC, Bluetooth, Z-Wave, ISA 100.11A.	8
IV	Wireless Sensor Network: Introduction, Components of Sensor Node, Modes of Detection, Challenges in WSN. UAV Network: Introduction, UAV Network (Feature, Challenges and Topology) FANET: Introduction, FANET design consideration.	8
V	Application of IoT: Smart Homes – Introduction, Origin of Smart Homes, Smart Home Technologies. Smart Cities – Characteristics of Smart Cities, Smart City Framework, Challenges in Smart Cities. Connected Vehicles – Introduction, levels of Automation, Vehicle to Everything(V2X) Paradigm, Vehicular Ad-hoc Network (VANETs)	8
Total Hours		40

Course Outcomes:

CO1: To understand the Fundamentals of IoT.

CO2: To know about the networking concepts of IoT.

CO3: To know about the different connectivity technologies.

CO4: To know about the WSN and UAV network.

CO5: To know about the various applications of IoT.

Text Book

1. Arshdeep Bagha and Vijay Madisetti, “Internet of Things – A hands-on approach”, Orient Blackswan Private Limited - New Delhi.
2. Dr. Jeeva Jose, Internet of Things, Khanna Publishing House.
3. Nitesh Dhanjani, Abusing the Internet of Things, Shroff Publisher/O’Reilly Publisher.

Reference Books

1. Internet of Things, RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan,John Wiley and Sons.
2. Internet of Things, Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram,John Wiley & Sons.
3. Cuno Pfister, “Getting Started with the Internet of Things”, Shroff Publisher/MakerMedia.
4. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1 st Edition, Apress Publications.
5. Massimo Banzi, Michael Shiloh Make: Getting Started with the Arduino, Shroff Publisher/Maker Media Publishers.

List/Links of e-learning resource

- https://onlinecourses.nptel.ac.in/noc19_cs65/preview

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	**2**	**1**	**2**										**1**	**2**
CO-2	**2**	**1**	**1**										**1**	**2**
CO-3	**2**	**1**	**1**										**1**	**2**
CO-4	**2**	**1**	**1**	**1**									**1**	**2**
CO-5	**2**	**1**	**1**	**1**									**1**	**2**

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Prof. Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year	VI/III	Program	B.Tech – Artificial Intelligence and Data Science

Subject Category	DE-3	Subject Code:	AI 604(C)	Subject Name	Robotics and process automation

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	1	-	4

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

Understand the RPA and the ability to differentiate it from other types of automation.

2. Model the sequences and the nesting of activities.

3. Experiment with workflow in a manner to get the optimized output from a Bot

UNITs	Descriptions	Hrs.
I	Automation RPA vs Automation - Processes & Flowcharts - Programming Constructs Types of Bots Workloads automated RPA Advanced Concepts - Standardization of processes - RPA Development methodologies SDLC - Robotic control flow architecture - RPA business case - RPA Team - Process Design Document/Solution Design Document Risks & Challenges with RPA - RPA and emerging ecosystem.	8
II	User Interface - Variables - Managing Variables - Naming Best Practices - Variables Panel The Arguments Panel - Importing New Namespaces- Control Flow - Control Flow Introduction - Control Flow Activities - Data Manipulation - Data Manipulation Introduction - Scalar variables, collections and Tables - Text Manipulation - Data Manipulation - Gathering and Assembling Data	8
III	Basic and Desktop Recording , Web Recording , Input/Output Methods Screen Scraping - Data Scraping - Scraping advanced techniques - Selectors - Defining and Assessing Selectors - Customization - Debugging - Dynamic Selectors - Partial Selectors - RPA Challenge - Image, Text & Advanced Citrix Automation - Introduction to Image & Text Automation - Image based automation - Keyboard based automation - Information Retrieval	8
IV	Monitoring system event triggers - Hotkey trigger - Mouse trigger - System trigger - Monitoring image and element triggers - An example of monitoring email - Example of monitoring a copying event and blocking it - Launching an assistant bot on a keyboard event, EXCEPTION HANDLING: Debugging and Exception Handling - Debugging Tools - Strategies for solving issues - Catching errors	8
V	DEPLOYING AND MAINTAINING THE BOT: Publishing using publish utility - Creation of Server - Using Server to control the bots - Creating a provision Robot from the Server - Connecting a Robot to Server - Deploy the Robot to Server - Publishing and managing updates - Managing packages - Uploading packages - Deleting packages.	8
Total Hours		40

Course Outcomes:

CO 1: Describe RPA, where it can be applied and how it's implemented.

CO 2: Shows the different types of variables, Control Flow and data manipulation techniques.

CO 3: Identify and understand Image, Text and Data Tables Automation.

CO 4: Describe how to handle the User Events and various types of Exceptions and strategies.

CO 5: Understand the Deployment of the Robot and to maintain the connection.

Text Book

Alok Mani Tripathi, "Learning Robotic Process Automation", Packt Publishing, 2018.

Reference Books-

1. Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston, "Introduction to Robotic Process Automation: a Primer", Institute of Robotic Process Automation,1st Edition 2015.
2. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant", Independently Published, 1st Edition 2018.
3. Srikanth Merianda,"Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation", Consulting Opportunity Holdings LLC, 1st Edition 2018.
4. 4. Lim Mei Ying, "Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes", Packt Publishing, 1st Edition 2018.

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Prof. Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		VI/III		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	OE-IV	Subject Code:		AI 605A	Subject Name	Artificial Intelligence				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

4 Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.

5 Review of classical problem solving: search and forward and backward chaining.

6 Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem etc.

UNITs	Descriptions	Hrs.
I	Definitions – Foundation and History of AI, Evolution of AI - Applications of AI, Classification of AI Systems with respect to environment. Artificial Intelligence vs Machine learning, Tic - Tac – Toe problem. Intelligent Agent: Concept of Rationality, nature of environment, structure of agents.	8
II	Heuristic Search Techniques: Generate-and-Test; Hill Climbing; Properties of A* algorithm, Best first Search; Problem Reduction. Constraint Satisfaction problem: Interference in CSPs; Back, tracking search for CSPs; Local Search for CSPs; structure of CSP Problem. Beyond Classical, Search: Local search algorithms and optimization problem, local search in continuous spaces, searching with nondeterministic action and partial observation, online search agent and unknown environments.	8
III	Game playing – Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic- Structured representation of knowledge	8
IV	Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques. Natural Language Processing Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing.Hopfield Network, Learning in Neural Networks, Application of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI and Symbolic AI.	8
V	Development Process, knowledge Acquisition. PROLOG Introduction, Syntax and Numeric Function, Basic List Manipulation, Functions, Predicates and Conditional, input, output and Local Variables, iteration and Recursion, Property Lists and Arrays, LISP and other AI Programming Languages.	8
Total Hours		40

Course Outcomes:

CO1: Describe various searching methods and reasoning in AI.
CO2: Uses of Knowledge Representation Techniques.
CO3: Analysis the concepts of reasoning and planning
CO4: Illustrate the concept of NLP and NN
CO5: Apply and evaluate AI Techniques using PROLOG and LISP

Text Book

1. Artificial Intelligence -By Elaine Rich And Kevin Knight (2nd Edition) Tata Mcgraw-Hill Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Universities Press.

Reference Books-

7. Introduction to Prolog Programming By Carl Townsend.
8. Programming with PROLOG —By Klocksin and Mellish.
9. Artificial Intelligence (Fifth Edition) -By George F Luger, Pearson Education.
10. Artificial Intelligence (Second Edition}-By Stuart Russell and Peter Norvig, Pearson Education.
11. Artificial Intelligence Application Programming, Tim Jones, Wiley India
12. Artificial Intelligence And Expert Systems - By D.W Patterson .

List/Links of e-learning resource

List and Links of e-learning resources:

- https://nptel.ac.in/courses/117103063/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

7. Write a program to solve 8 queens problem
8. Solve any problem using depth first search.
9. Solve any problem using best first search.
10. Solve 8-puzzle problem using best first search
11. Solve travelling salesman problem.
12. Write a program to solve the Monkey Banana problem

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		V/III		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	OC-2	Subject Code:		AI 605(B)	Subject Name	Data Science Analytics				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3

Prerequisites:

- Data Science,
- Machine Learning

Course Objective:

1. To provide the knowledge and expertise to become a proficient data scientist;
2. Demonstrate an understanding of statistics and machine learning concepts that are vital for data science;
3. Produce Python code to statistically analyze a dataset;
4. Critically evaluate data visualizations based on their design and use for communicating stories from data;

UNITs	Descriptions	Hrs.
I	**Statistical Analysis System(SAS)**: Collection of Data, Sample Measurement and Scaling Techniques, Statistical Derivatives and Measures of Central Tendency, Measures of Variation and Skewness, Correlation and Simple Regression, Time Series Analysis, Index Numbers, Probability and Probability Rules Probability Distributions, Tests of Hypothesis–I, Tests of Hypothesis – II, Chi-Square Test	8
II	**Apache Spark**: Introduction, Features, Spark built on Hadoop,Components of Spark: Apache Spark Core, Spark SQL, Spark Streaming, MLlib (Machine Learning Library), GraphX **BigML: Web Interface, Command Line Interface, API, Creating a deep learning model with BigML**	8
III	**Data-Driven Documents (D3.js)**: Introduction, Web Standards: HyperText Markup Language (HTML), Document Object Model (DOM), Cascading Style Sheets (CSS), Scalable Vector Graphics (SVG), JavaScript. **MatLab**: Matlab Environment Setup, Syntax, Variables, Commands, M-files, Datatypes and Operators.	8
IV	**Natural Language Toolkit (NLTK)**:Tokenizing Text, Training Tokenizer & Filtering Stopwords, Looking up words in Wordnet Stemming & Lemmatization, Natural Language Toolkit - Word Replacement, Synonym & Antonym Replacement. **TensorFlow**: Convolutional Neural Networks, TensorBoard Visualization, TensorFlow - Word Embedding, TensorFlow - Linear Regression	8
V	**Tableau**: Design Flow, File Types, Data Types, Data Terminology, Data source, worksheet and calculations. **Scikit-learn**: Introduction, Modelling Process, Data Representation, Estimator	8

	API, Conventions, Linear Modeling	
Total Hours		40

Course Outcomes:

CO1: To explain how data is collected, managed and stored for data science.

CO2: To understand the key concepts in Big data science, including their real-world applications and the toolkit used for Big Data

CO3: To implement data collection and management scripts using D3.js.

CO4: Examine the techniques of NLTK toolkit and Tensor flow.

CO5: Identification of various applications of Tableau.

Text Book

1. Statistical Data Analysis Using SAS: Intermediate Statistical Methods (Springer Texts in Statistics)

2. Big Data and Analytics, 2ed | IM | BS | e Paperback – 1 January 2019
by Subhashini Chellappan Seema Acharya (Author)

Reference Books-

1. Big Data For Dummies by Judith S. Hurwitz, Alan Nugent

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		V/III		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	OC-2	Subject Code:		AI 605 C	Subject Name	Image Processing				

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3

Prerequisites:

Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

1. To study the image fundamentals and mathematical transforms necessary for image processing.
2. To study the image enhancement techniques
3. To study image restoration procedures.
4. To study the image compression procedures.

UNITs	Descriptions	Hrs.
I	**Digital Image Fundamentals** A simple image model, Sampling and Quantization. Relationship between pixels. Imaging geometry. Image acquisition systems, Different types of digital images.	8
II	**Image Transformations Introduction** to Fourier transforms, Discrete Fourier transforms, Fast Fourier transform, Walsh transformation, Hadmord transformation, Discrete Cosine Transformation.	8
III	**Image Enhancement** Filters in spatial and frequency domains, Histogram based processing. Image subtraction, Averaging, Image smoothing, Nedion filtering, Low pass filtering, Image sharpening by High pass filtering	8
IV	**Image Encoding and Segmentation** Encoding: Mapping, Quantizer, Coder. Error free compression, Lossy Compression schemes. JPEG Compression standard. Detection of discontinuation by point detection, Line detection, edge detection, Edge linking and boundary detection, Local analysis, Global processing via Hough transforms and graph theoretic techniques.	8
V	**Mathematical Morphology** Binary, Dilation, crosses, Opening and closing, Simple methods of representation, Signatures, Boundary segments, Skeleton of a region, Polynomial approximation.	8
Total Hours		40

Course Outcomes:

CO-1: Ability to apply principles and techniques of digital image processing in applications related to design and analysis of digital imaging systems.
CO-2: Ability to analyze and implement image processing algorithms to real problems.
CO-3: Gaining of hands-on experience in using software tools for processing digital images.
CO-4: Interpret image segmentation and representation techniques.
CO-5: Apply Mathematical Morphology using Polynomial approximation.

Text Book

1. Thomas Cormen, Charles Leiserson, Ronald Rivest and Cliford Stein, “Introduction to Algorithms”, PHI, 3rd edition.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Universities Press.

Reference Books-

1. Sonka, Digital Image Processing & Computer Vision, Cengage Learning.
2. Jayaraman, Digital Image Processing, TMH.
3. Pratt, Digital Image Processing, Wiley India.
4. Annadurai, Fundamentals of Digital Image Processing,Pearson Education

List/Links of e-learning resource

1. www.nptel.co.in

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

NO LAB

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		VI/III	Program	B.Tech – Artificial Intelligence and Data Science
Subject Category	DLC	Subject Code: AI 606	Subject Name	Advanced Data Science Lab II

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
				30	10	10	50			2	1

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

- How to use R for analytical programming
- How to implement data structure in R
- R loop functions and debugging tools
- Object-oriented programming concepts in R
- Data visualization in R
- How to perform error handling
- Writing custom R functions

UNITs	Descriptions	Hrs.
I	Creating strings, paste() and paste0(), Formatting numbers and string using format(), String manipulation	8
II	Creating lists, manipulating list elements, merging lists, Converting lists to vectors	8
III	ARRAYS IN R: Creating arrays, Accessing array elements, Calculations across array elements	8
IV	R FACTORS: Understanding factors, Modifying factors, Factors in Data frames	8
V	Creating data frame: Operations on data frames, Accessing data frames, Creating data frames from various sources, need for data visualization, Bar plot, Plotting categorical data, Stacked bar plot, Histogram, plot() function and line plot, pie chart / 3D pie chart, Scatter plot, Box plot	8
Total Hours		40

Course Outcomes:

CO1: Explain critical R programming concepts for data preprocessing CO2: Analyze data and generate reports based on the data in the R
CO3: Apply machine learning concepts in R programming

Text Book

R for data science : Import, Tidy, Transform, Visualize, And Model Data by Hadley Wickham (Author), Garrett Grolemund (Auth o

Reference Books-

The Book of R: A First Course in Programming and Statistics by Tilman M. Davies (Author)

Experiment List:

Experiments (R-Intermediate)	
Write an R script to handle outliers.	CO1
Write an R script to handle invalid values.	CO1
Visualize iris dataset using mosaic plot.	CO2
Visualize correlation between sepal length and petal length in iris data set using scatter plot.	CO2
Experiments(R- Advance)	
Linear Regression: Consider the following mice data: Height:140,142,150,147,139,152,154,135,148, 147. Weight: 59, 61, 66, 62, 57, 68, 69, 58, 63, 62. Derive relationship coefficients and summary for the above data.	CO3
Consider the above data and predict the weight of a mouse for a given height and plot the results using a graph.	CO3
Logistic Regression: Analyse iris data set using Logistic Regression. Note: create a subset of iris dataset with two species.	CO3
Perform Logistic Regression analysis on the above mice data(Sl.No.21) and plot the results.	CO3
Decision Tree: Implement ID3 algorithm in R.	CO3
Implement C4.5 algorithm in R.	CO3
Time Series: Write R script to decompose time series data into random, trend and seasonal data.	CO2
Write R script to forecast time series data using single exponential smoothing method.	CO2
Clustering: Implement K-means algorithm in R.	CO3
Implement CURE algorithm in R.	CO3

Write an R script to handle outliers.	CO1

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end Semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Prof. Ramratan Ahirwal
Subject handled by department	Department of IT