

Course Code	Course Name	Group	Teaching Scheme	Credits
			Lectures	
RJDSEDSAI351	Introduction to Cloud Computing	Elective	4	4

Course Outcomes (COs)

After completing this course, students will be able to:

1. Understand Cloud Computing Fundamentals
2. Explore Cloud Architectures
3. Utilize Cloud Service Providers
4. Implement Cloud-Based Solutions
5. Manage Cloud Storage and Databases
6. Analyze Security and Compliance in the Cloud
7. Optimize Cloud Performance and Costs
8. Develop Cloud-Native Applications
9. Integrate Cloud with Emerging Technologies

Learning Outcomes (LOs)

By the end of the course, students should be able to:

1. Define cloud computing and explain its benefits, challenges, and use cases.
2. Differentiate between traditional IT infrastructure and cloud-based architectures.
3. Identify and work with various cloud service and deployment models.
4. Use cloud platforms to deploy and manage applications.
5. Implement cloud storage, compute, and networking solutions.
6. Analyze security concerns and best practices for cloud environments.
7. Optimize cloud resources for scalability, performance, and cost-efficiency.
8. Apply cloud computing concepts to real-world applications and projects.

UNIT	TOPICS
UNIT - I	Fundamentals of Cloud Computing: What is Cloud Computing? History & Evolution of Cloud Computing, Benefits and Challenges of Cloud Computing, Cloud Deployment Models (Public, Private, Hybrid, Multi-Cloud), Cloud Service Models (IaaS, PaaS, SaaS) Cloud Computing Architecture: Virtualization & Containerization (VMs, Docker, Kubernetes), Cloud Storage & Databases (Object Storage, Block Storage, SQL & NoSQL DBs), Networking in Cloud (CDN, Load Balancers, VPC, VPN), Cloud Security Basics (IAM, Encryption, Compliance)
UNIT - II	Cloud Computing Service Providers: Overview of AWS, Microsoft Azure, and Google Cloud, Key Services: Compute (EC2, Azure VM, GCE), Storage (S3, Blob, GCS), Databases (RDS, CosmosDB, Firestore), Cloud Pricing Models & Cost Optimization Cloud Security & Compliance: Identity & Access Management (IAM), Security Risks in Cloud Computing, Compliance Standards (ISO 27001, GDPR, HIPAA), Backup & Disaster Recovery Strategies
UNIT - III	Serverless Computing & Cloud Automation: Introduction to Serverless (AWS Lambda, Azure Functions, Google Cloud Functions), Infrastructure as Code (Terraform, AWS CloudFormation), DevOps & CI/CD in the Cloud (Jenkins, GitHub Actions, AWS CodePipeline) Cloud-based Big Data & AI Services: Introduction to Cloud-based Big Data (AWS EMR, Azure HDInsight, Google BigQuery), Cloud AI & ML Services (AWS SageMaker, Azure AI, Google AI Platform), Internet of Things (IoT) on Cloud
UNIT - IV	Future Trends & Real-World Applications: Edge Computing & Fog Computing, Multi-Cloud and Hybrid Cloud Strategies, Cloud Case Studies (Healthcare, E-commerce, Banking), Industry Certifications (AWS Certified Cloud Practitioner, Microsoft Azure Fundamentals, Google Cloud Associate)
References: 1. "Cloud Computing: Concepts, Technology & Architecture" – Thomas Erl, Ricardo Puttini, Zaigham Mahmood 2. "Cloud Computing: A Hands-on Approach" – Arshdeep Bahga, Vijay Madisetti 3. "Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, IaaS)" – Michael J. Kavis 4. "AWS Certified Solutions Architect Study Guide" – Ben Piper, David Clinton 5. "Mastering Cloud Computing: Foundations and Applications Programming" – Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi	

Practical List:

1. Compare different cloud service providers (AWS, Azure, Google Cloud)
2. Deploy a Virtual Machine (VM) in AWS, Azure, or GCP
3. Deploy a simple web application on AWS/Azure/GCP
4. Set up IAM roles and policies in AWS/Azure
5. Deploy a serverless function on AWS Lambda or Google Cloud Functions
6. Perform a basic data analysis using Google BigQuery or AWS Athena
7. Build and deploy a fully functional cloud-based solution (e.g., e-commerce site, chatbot, data pipeline)

Course Code	Course Name	Group	Teaching Scheme	Credits
			Lectures	
RJDSEDSAI352	Data Mining & Warehousing	Elective	4	4

Course Outcome:

1. Understand the concept and framework of data warehousing and differentiate between OLAP and OLTP.
2. Gain knowledge of data mining techniques and their applications in knowledge discovery.
3. Acquire skills in data preprocessing, including handling missing data, cleaning, integration, and transformation.
4. Apply association rules mining algorithms such as APRIORI and FP-Growth to discover frequent item sets.

Learning Outcome:

1. Explain the purpose and components of a data warehouse and differentiate it from transactional databases.
2. Perform OLAP operations on a multidimensional data model to analyze and query data.
3. Implement data preprocessing techniques to address missing data and prepare the data for mining.
4. Apply association rules mining algorithms to discover patterns and relationships in large datasets.

UNIT	TOPICS
UNIT - I	Introduction to Data Warehouse: Introduction, Necessity, Framework of the data warehouse, options, developing data warehouses, Differences between OLAP and OLTP, OLAP Operations in the Multidimensional Data Model, Back-End Tools and Utilities, Metadata Repository, Types of OLAP servers. DW Design Consideration And Dimensional Modeling: Defining Dimensional Model, Granularity of Facts, Additivity of Facts, Functional dependency of the Data, Helper Tables, Implementation many-to-many relationships between fact and dimensional modeling. Data Warehouse Models: Enterprise Data Warehouse (EDW), Data Mart, Virtual Data Warehouse, Hybrid Data Warehouse
UNIT - II	Data Mining: Introduction to Data Mining, Definition, Knowledge Discovery in Data (KDD), Kinds of databases, Data to be mined, Basic

	mining techniques, Data Mining Issues, Data Mining Metrics, Social Implications of Data Mining, Overview of Applications of Data Mining. Data Preprocessing: Data Processing prerequisites, Attributes and Data types, Statistical descriptions of data, Distance and similarity measures, Need for Preprocessing, Handling Missing data, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.
UNIT - III	Association Rules Mining: Problem Definition, Frequent item set generation, The APRIORI Principle, Support and confidence measures, Association rule generation: APRIORI algorithm, FP-Growth Algorithms, Compact Representation of Frequent item Set: Maximal Frequent item set, closed frequent item set. Classification And Prediction: Definition of classification, Model construction, Model Usage, Choosing algorithm, Decision tree Induction, Information gain, gain ratio, gini index, Bayesian Classification, Bayes Theorem, Linear Regression.
UNIT - IV	Logistic Regression. Validating Model: Measuring performance of classifiers, Precision, Recall, F-measure, confusion matrix, cross-validation, Bootstrap. Clustering: Types of data, Categorization of major clustering methods, Kmeans partitioning methods, Hierarchical methods, Density-based methods, Grid-based methods, Model-based clustering methods, Outlier analysis, Mining Time-Series and Sequence Data, Mining Text Databases, Mining the World Wide Web.
References 1. Data Warehousing : Design, Development And Best Practices by Soumendra Mohanty (Author), Tata McGraw Hill Education (Publisher). 2. Jiawei Han, Micheline Kamber, "Data Mining-Concepts and techniques", Morgan Kaufmann Publishers, Elsevier, 3rd Edition. 3. Alex Berson, Stephen J.Smith, "Data warehousing Data mining and OLAP", Tata McGraw- Hill, 2nd Edition	

Practical List:

1. Perform different operations of extraction, transformation, and loading (ETL) processes on a sample dataset using tools.
2. Integrate data from multiple sources by merging and transforming datasets using Python's pandas library and data manipulation techniques.
3. Apply feature selection techniques like variance thresholding and correlation analysis using Python's scikit-learn library to reduce dimensionality in a dataset.
4. Discretize continuous variables and create concept hierarchies for categorical variables in a market basket dataset using Python's pandas library.
5. Implement the Apriori algorithm in Python to mine frequent itemsets from a retail transaction dataset and extract association rules.
6. Build a decision tree classifier using Python's scikit-learn library to predict customer churn based on historical data.
7. Implement a Naive Bayes classifier in Python using scikit-learn to classify emails as spam or non-spam based on their content.
8. Implement a linear regression method to make predictions based on the sample data set using Python.
9. Implement a logistic regression method to make predictions based on the sample data set using Python.
10. Implement K-means clustering algorithm in Python using scikit-learn to group customers based on their purchasing behavior.

Course Code	Course Name	Group	Teaching Scheme	Credits
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RJDSEDSAI361	Healthcare Analytics	Elective	4	4

Course Outcomes (COs)

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

1. Understand Healthcare Data
2. Data Preprocessing & Management
3. Statistical & Predictive Analytics
4. Healthcare Data Visualization
5. Disease Prediction & Risk Assessment
6. Big Data & AI in Healthcare
7. Healthcare Policy & Ethical Considerations
8. Real-world Applications

Learning Outcomes (LOs)

After completing the course, students should be able to:

1. Explain the fundamental concepts of healthcare data analytics and its role in decision-making.
2. Preprocess and manage healthcare datasets for effective analysis.
3. Apply statistical and machine learning techniques to healthcare problems.
4. Interpret healthcare analytics results using appropriate visualization tools.
5. Develop predictive models for disease diagnosis and patient outcome forecasting.
6. Evaluate healthcare analytics solutions for accuracy, bias, and ethical concerns.
7. Integrate AI and big data techniques for advanced healthcare analytics.
8. Demonstrate the ability to solve real-world healthcare problems using analytics approaches.

UNIT	TOPICS
UNIT - I	Introduction to Healthcare Analytics: Overview of Healthcare Systems & Data Sources, Role of Analytics in Healthcare Decision-Making, Types of Healthcare Data (EHR, Claims Data, Clinical Trials, IoT Devices), Ethical Considerations & HIPAA Compliance Healthcare Data Management & Visualization: Data Collection & Preprocessing (Missing Data, Outliers, Standardization), Data Warehousing & Integration in Healthcare, Data Visualization Techniques (Dashboards, Heatmaps, KPI Metrics), Introduction to BI Tools (Tableau, Power BI, Python Matplotlib & Seaborn)

UNIT - II	Descriptive & Predictive Analytics in Healthcare: Statistical Measures & Trends in Healthcare Data, Machine Learning Basics for Healthcare (Regression, Decision Trees, Random Forests), Predicting Patient Readmission & Disease Progression, Risk Stratification & Population Health Management AI & Machine Learning in Healthcare: Deep Learning for Medical Imaging (CNNs for X-ray, MRI, CT Scan Analysis), Natural Language Processing (NLP) for Clinical Text Analysis, AI Applications in Drug Discovery & Genomics, Bias, Fairness & Explainability in AI-driven Healthcare Models
UNIT - III	Healthcare Operations & Financial Analytics: Cost Optimization & Resource Allocation in Hospitals, Fraud Detection in Healthcare Claims, Predictive Analytics for Revenue Cycle Management, Supply Chain & Inventory Analytics in Healthcare Big Data & Cloud Computing in Healthcare: Introduction to Healthcare Big Data (Apache Spark, Hadoop, FHIR), Cloud-based Healthcare Analytics (AWS, Google Cloud, Azure), IoT & Wearable Data in Remote Patient Monitoring, Privacy & Security Challenges in Cloud Healthcare Solutions
UNIT - IV	Real-World Applications & Case Studies: Predicting Disease Outbreaks using Analytics, AI-powered Chatbots for Patient Engagement, Telemedicine & Remote Patient Monitoring Analytics, Precision Medicine & Personalized Treatment Plans
References 1. "Healthcare Analytics: From Data to Knowledge to Healthcare Improvement" – David B. Agus & Hui Yang 2. "Healthcare Analytics: From Data to Knowledge to Healthcare Improvement" – David B. Agus & Hui Yang 3. "Big Data and Healthcare Analytics" – Katherine Marconi & Harold Lehmann 4. "Healthcare Data Analytics" – Chandan K. Reddy & Charu C. Aggarwal 5. "Machine Learning for Healthcare" – John D. Kelleher 6. "Data Science for Healthcare: Methodologies and Applications" – Vikas Kumar 7. "Clinical Prediction Models: A Practical Approach to Development, Validation, and Updating" – Ewout Steyerberg	
Practical List: 1. Explore publicly available healthcare datasets (e.g., MIMIC, CDC, WHO) 2. Build an interactive healthcare dashboard in Tableau/Power BI 3. Predict hospital readmission rates using Python (scikit-learn) 4. Build a Deep Learning Model for medical image classification using TensorFlow/Keras 5. Analyze insurance claim fraud using R/Python 6. Process large-scale patient records using Google BigQuery 7. Develop a predictive healthcare model (e.g., early detection of diabetes, predicting ICU admission, AI-based diagnostics)	

Course Code	Course Name	Group	Teaching Scheme	Credits
			Lectures	
RJDSEDSAI362	Natural Language Processing	Elective	4	4

Course Outcome:

1. To understand natural language processing and to learn how to apply basic algorithms in this field.
2. To get acquainted with the basic concepts and algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics.
3. To design and implement applications based on natural language processing
4. To implement various language Models.
5. To design systems that uses NLP techniques

Learning Outcome:

Upon completion of this course, the student should be able to

1. Have a broad understanding of the field of natural language processing.
2. Have a sense of the capabilities and limitations of current natural language technologies,
3. Be able to model linguistic phenomena with formal grammars.
4. Be able to Design, implement and test algorithms for NLP problems
5. Understand the mathematical and linguistic foundations underlying approaches to the various areas in NLP
6. Be able to apply NLP techniques to design real world NLP applications such as machine translation, text categorization, text summarization, information extraction...etc.

UNIT	TOPICS
	Introduction: History of NLP, Generic NLP system, levels of NLP , Knowledge in language processing , Ambiguity in Natural language , stages in NLP, challenges of NLP ,Applications of NLP Applications : Machine translation, Information retrieval, Question answers system, categorization, summarization, sentiment analysis, Named Entity Recognition.
	Word Level Analysis Morphology analysis –survey of English Morphology, Inflectional morphology & Derivational morphology, Lemmatization, Regular expression, finite automata, finite state transducers (FST) ,Morphological parsing with FST , Lexicon free FST Porter stemmer. N –Grams- N-gram language model, N-gram for spelling correction.
	Syntax analysis Part-Of-Speech tagging(POS)- Tag set for English (Penn Treebank) , Rule based POS tagging, Stochastic POS tagging, Issues – Multiple tags & words, Unknown words. Introduction to CFG, Sequence

	labeling: Hidden Markov Model (HMM), Maximum Entropy, and Conditional Random Field (CRF).
	Semantic Analysis Lexical Semantics, Attachment for fragment of English-sentences, noun phrases, Verb phrases, prepositional phrases, Relations among lexemes & their senses –Homonymy, Polysemy, Synonymy, Hyponymy, WordNet, Robust Word Sense Disambiguation (WSD) ,Dictionary based approach Pragmatics Discourse –reference resolution, reference phenomenon , syntactic & semantic constraints on co reference
References: 1. Siddiqui and Tiwary U.S., Natural Language Processing and Information Retrieval, Oxford University Press (2008). 2. Daniel M Bikel and Imed Zitouni — Multilingual natural language processing applications Pearson, 2013 3. Alexander Clark (Editor), Chris Fox (Editor), Shalom Lappin (Editor) — The Handbook of Computational Linguistics and Natural Language Processing — ISBN: 978-1-118- 4. Steven Bird, Ewan Klein, Natural Language Processing with Python, O'Reilly 5. Brian Neil Levine, An Introduction to R Programming 6. Niel J le Roux, Sugnet Lubbe, A step by step tutorial : An introduction into R application and	

Practical List: 1. Preprocessing of text (Tokenization, Filtration, Script Validation, Stop Word Removal, Stemming) 2. Morphological Analysis 3. N-gram model 4. POS tagging 4. Chunking 5. Named Entity Recognition 6. Case Study/ Mini Project based on Application mentioned in Module
