Bachelor of Technology (Artificial Intelligence & Data Science)										
Modified Credit Based Scheme of Studies/Examination										
Semester V (w.e.f Session 2023-2024)										
S.No.	Course Code	Subject	L:T:P	Hours/Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1	AI-DS-301A	Big Data Analytics	3:0:0	3	3	75	25	0	100	3
2	AI-DS-303A	Machine Learning	3:0:0	3	3	75	25	0	100	3
3	AI-DS-305A	Artificial Neural Networks	4:0:0	4	4	75	25	0	100	3
4	AI-DS-307A	Digital Image Processing	3:0:0	3	3	75	25	0	100	3
5	PEC	Elective-I	4:0:0	4	4	75	25	0	100	3
6	AI-DS-309LA	Project –I	0:0:4	4	2	--	100	100	200	3
7	AI-DS-311LA	Digital Image Processing Lab	0:0:3	3	1.5	--	40	60	100	3
8	AI-DS-313LA	Machine Learning Lab	0:0:3	3	1.5	--	40	60	100	3
		Total		**27**	**22**	**375**	**305**	**220**	**900**	
9	SIM-301A*	Seminar on Summer Internship	2:0:0	2	0	0	50	0	50	
10	MC-904A	Energy Resources & Management	3:0:0	3	0	0	100	0	100	3

SIM-301*A is a mandatory credit-less course in which the students will be evaluated for the Summer Internship undergone after 4th semester and students will be required to get passing marks to qualify.

PEC Elective-I
Fuzzy Logic and Applications PE-AI-DS-T301A
Genetic Algorithm PE-AI-DS-T303A
Application of Data Science in Industry PE-AI-DS-T305A

AI-DS-301A	Big Data Analytics						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 hrs**
Purpose	**To familiarize the students with the Big Data Analytics**						
Course Outcomes(CO)							
CO 1	Understand the Big Data Platform and its Use cases.						
CO 2	Understand Apache Hadoop, Provide hands on Hodoop Eco System.						
CO 3	Understand Map Reduce Jobs, Apply analytics on Structured, Unstructured Data.						
CO 4	Exposure to Data Analytics with R.						

UNIT-I

INTRODUCTION TO BIG DATA AND HADOOP: Types of Digital Data, Introduction to Big Data, Big Data Analytics, 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

UNIT-II

HDFS(Hadoop Distributed File System): The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

Map Reduce: Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features

UNIT- III

Hadoop Eco System: Pig : 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

UNIT-IV

Data Analytics with R Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

Suggested Books:

1. Text Books • Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

References Books:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)

AI-DS-303A	Machine Learning						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 hrs**
Purpose	**To familiarize the students with the Machine learning**						
Course Outcomes(CO)							
CO 1	Extract features that can be used for a particular machine learning approach in various IOT applications.						
CO 2	Compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.						
CO 3	To mathematically analyse various machine learning approaches and paradigms.						
CO 4	Modeling and estimation of machine learning						

UNIT-I

Supervised Learning: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes, Linear Regression, Logistic Regression, Generalized Linear Models Support Vector Machines, Nonlinearity and Kernel Methods, Beyond Binary Classification: Multi-class/Structured Outputs, Ranking.

UNIT-II

Unsupervised Learning: Clustering: K-means/Kernel K-means Dimensionality Reduction: PCA and kernel PCA, Matrix Factorization and Matrix Completion, Generative Models (mixture models and latent factor models)

UNIT- III

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests), Introduction to scalable machine learning, Recent trends in various learning techniques of machine learning.

UNIT-IV

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning

Suggested Books:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press,

References Books:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)
2. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

AI-DS-305A	Artificial Neural Networks						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**-**	**-**	**4**	**75**	**25**	**100**	**3 hrs**
Purpose	**To familiarize the students with the Artificial Neural Networks**						
Course Outcomes(CO)							
CO 1	To learn the basics of artificial neural networks concepts.						
CO 2	Expose detailed explanation of various neural networks architecture.						
CO 3	To explore knowledge of special types of Artificial neural networks.						
CO 4	To explore deep neural networks and fuzzy logic techniques.						

UNIT-I

Fundamentals of Artificial Neural Networks Introduction: Concepts of neural networks, Characteristics of Neural Networks, Applications of Neural Networks. Fundamentals of Neural Networks: The biological prototype, Neuron concept, Single layer Neural Networks, Multi-Layer Neural Networks, terminology, Notation and representation of Neural Networks, Training of Artificial Neural Networks. Representation of perceptron, perceptron learning and training, Classification, linear Separability

UNIT-II

Neural Networks Hopfield nets: Structure, training, and applications, Back Propagation: Concept, Applications and Back Propagation Training Algorithms. Counter Propagation Networks: Kohonan Network, Grossberg Layer & Training, applications of counter propagation, Image classification. Bi-directional Associative Memories: Structure, retrieving a stored association, encoding associations.

UNIT- III

Special Neural Networks ART: ART architecture, ART classification operation, ART implementation and characteristics of ART. Image Compression Using ART, Optical Neural Networks: Vector Matrix Multipliers, Hop field net using Electro optical matrix multipliers, Holographic correlator, Optical Hopfield net using Volume Holograms, Cognitrons and Neocognitrons: structure and training.

UNIT-IV

Deep Learning Neural Networks Deep Networks: CNN, RNN, LSTM, Attention layers, Applications, Techniques to improve deep networks: DNN Optimization, Regularization, AutoML.

Suggested Books:

1. Li Min Fu, "Neural Networks in Computer Intelligence", McGraw-Hill, Inc. 2012.
2. S N Sivanandam, "Neural Networks using MATLAB 6.0", TMH, 4th. Reprint 2015.
3. Freeman J.A. & D.M. Skapura, "Neural Networks: Algorithms, Applications and Programming Techniques", Addison Wesley, Reading, Mass, 2014.

References Books:

1. Deep Learning (Ian J. Goodfellow, YoshuaBengio and Aaron Courville), MIT Press, 2016.
2. Deep Learning with Python: A Hands-On Introduction by Ketkar, Apress
3. François Chollet, Fundamentals of Deep Learning: Designing next-generation machine intelligence algorithms, Manning Publications, 2017

AI-DS-307A	Digital Image Processing						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 hrs**
Purpose	**To familiarize the students with the Digital Image Processing**						
Course Outcomes(CO)							
CO 1	Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.						
CO 2	Operate on images using the techniques of smoothing, sharpening and enhancement.						
CO 3	To explore knowledge of image segmentation						
CO 4	To explore image compression and recognition						

UNIT-I

Digital Image Fundamentals Networks Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

UNIT-II

Image Enhancement Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

UNIT- III

Image Restoration Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

UNIT-IV

Image Segmentation Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing-erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm. **Image Compression and Recognition** Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

Suggested Books:

1. Rafael C. Gonzalez, Richard E. Woods, _Digital Image Processing‘, Pearson, Third Edition, 2010.
2. Anil K. Jain, _Fundamentals of Digital Image Processing‘, Pearson, 2002.

References Books:

1. Kenneth R. Castleman, _Digital Image Processing‘, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, _Digital Image Processing using MATLAB‘, Pearson Education, Inc., 2011.

AI-DS-311LA	Digital Image Processing Lab						
L	**T**	**P**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
-	**-**	**3**	**1.5**	**60**	**40**	**100**	**3 hrs**
Purpose	**To Introduce students with Digital Image Processing**						
Course Outcomes(CO)							
CO 1	**To formulate the processing of images with simple problems.**						
CO 2	**Implementation of Non-Linear filtering Techniques.**						
CO 3	**Implementation of High frequency components of an images.**						
CO 4	**Implementation of Various Segmentation of an images.**						

LIST OF PROGRAMS

1. To create a program to display grayscale image using read and write operation.
2. To create a vision program to find histogram value and display histograph of a grayscale and color image.
3. To create a vision program for Non-Linear Filtering technique using edge detection
4. create a vision program to determine the edge detection of an image using different operators.
5. To create a program to discretize an image using Fourier transformation.
6. To create a program to eliminate the high frequency components of an image.
7. To create a color image and perform read and write operation**.**
8. To obtain the R, B, G colour values and resolved colour values from a colour box by choosing any colour.
9. To create a program performs discrete wavelet transform on image.
10. To create a program for segmentation of an image using watershed transforms.

AI-DS-313LA	Machine Learning Lab						
L	**T**	**P**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
-	**-**	**3**	**1.5**	**60**	**40**	**100**	**3 hrs**
Purpose	**To Introduce students with Machine Learning**						
Course Outcomes(CO)							
CO 1	**To formulate the processing on data samples.**						
CO 2	**Implementation of Back Propagation algorithm.**						
CO 3	**Implementation of K-mean cluster.**						
CO 4	**Implementation of Weighted Regression Algorithm.**						

LIST OF PROGRAMS

1. Implement and demonstratethe FIND-Salgorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithmto output a description 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 toclassify a new sample.

4. Build an Artificial Neural Network by implementing the Backpropagation 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 data sets.

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.

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.

MC-904A	Energy Resources & Management						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**0**	-	**100**	**100**	**3**
Purpose	To make the students conversant with the basics concepts and conversion of various form of Energy						
COURSE OUTCOMES							
CO1	An overview about Energy Resources, Conventional and Non-conventional sources						
CO2	Understand the Layout and working of Conventional Power Plants						
CO3	Understand the Layout and working of Non-Conventional Power Plants						
CO4	To understand the Energy Management, Audit and tariffs, Role of Energy in Economic development and Energy Scenario in India						

UNIT-I

Introduction: Types of energy, Conversion of various forms of energy, Conventional and Non-conventional sources, Need for Non-Conventional Energy based power generation.

UNIT-II

Conventional Energy sources: Types of Conventional Energy sources, Selection of site**,** working of Thermal, Hydro, Nuclear and Diesel power plants and their schematic diagrams & their comparative advantages/ disadvantages.

UNIT-III

Non-Conventional Energy sources: Types ofNon-Conventional Energy sources , Basic principle, site selection of Solar energy power plant, photovoltaic technologies, PV Systems and their components, Wind energy power plant , Bio energy plants ,Geothermal energy plants and Tidal energy plants.

UNIT-IV

Energy Management: General Principles of Energy Management, Energy Management Strategy, Modern trends and developments towards Computerizations of Power System.

Energy Audit: Need, Types, Methodology and Approach.

Energy Scenario: Lay out of power system, Role of Energy in Economic development, energy demand, availability and consumption, Indian energy scenario, long term energy scenario, energy sector reforms in India, energy strategy for the future.

References:

- Energy Studies-Wiley Dream Tech India.
- Non-conventional energy resources- Shobhnath Singh, Pearson.
- Electrical Power Systems : Soni, Gupta, Bhatnagar – Dhanpat Rai & Sons
- NEDCAP: Non Conventional Energy Guide Lines
- Non conventional energy sources : G.D. Roy
- Non Conventional energy resources :B H Khan - McGraw Hill
- Applied Solar Energy : Meinel A B - Addison Wesley Publications
- Direct Energy ConversionGeorge: Sutton -McGraw

PE-AI-DS-T301A	Fuzzy Logic and Applications						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**-**	**-**	**4**	**75**	**25**	**100**	**3 hrs**
Purpose	To make the students understand the concept of fuzzy logic and application.						
COURSE OUTCOMES							
CO1	An overview about Fuzzy Sets.						
CO2	Understand the working of extension and graphs.						
CO3	Understand Fuzzy relation and fuzzy graph.						
CO4	To understand application of fuzzy set theory and control.						

UNIT-I

Introduction to Fuzzy Sets: Crispness , Vagueness, Fuzziness, Uncertainty, Fuzzy Set Theory **Fuzzy Mathematics: Fuzzy Sets-Basic Definitions**- Basic Definitions, Basic Set-Theoretic Operations for Fuzzy Sets, **Fuzzy Measures and Measures of Fuzziness:** Fuzzy Measures, Measures of Fuzziness.

UNIT-II

Extensions: Types of Fuzzy Sets, Further Operations on Fuzzy Sets, Algebraic Operations, Set-Theoretic Operations, Criteria for Selecting Appropriate Aggregation Operators **The Extension Principle and Applications:** The Extension Principle, Operations for Type 2 Fuzzy Sets, Algebraic Operations with Fuzzy Numbers, Special Extended Operations, Extended Operations for LR-Representation of Fuzzy Sets.

UNIT-III

Fuzzy Relations and Fuzzy Graphs: Fuzzy Relations on Sets and Fuzzy Sets, Compositions of Fuzzy Relations, Properties of the Min-Max Composition, Fuzzy Graphs, Special Fuzzy Relations **Uncertainty Modeling:** Application-oriented Modeling of Uncertainty, Causes of Uncertainty, Uncertainty Methods, Possibility Theory, Fuzzy Sets and Possibility Distributions, Probability of Fuzzy Events, Probability of a Fuzzy Event as a Scalar, Probability of a Fuzzy Event as a Fuzzy Set, Possibility vs. Probability.

UNIT-IV

Applications of Fuzzy Set Theory: Fuzzy Logic, Fuzzy Languages **Fuzzy Sets and Expert Systems:** Introduction to Expert Systems, Uncertainty Modeling in Expert Systems, Applications **Fuzzy Control:** Origin and Objective, The Fuzzy Controller, Types of Fuzzy Controllers, Design Parameters, Adaptive Fuzzy Control, Applications, Tools, Stability, Extensions.

References:

1. H.-J. Zimmermann, Fourth Edition, 'Fuzzy Set Theoryand Its Applications'
2. Lotfi A Zadeh, Rafik Aziz Aliev, Fuzzy Logic Theory And Applications: Part I And Part Ii
3. Guanrong Chen, Trung Tat Pham, Fuzzy Sets, Fuzzy Logic, and Fuzzy Control Systems

PE-AI-DS-T303A	Genetic Algorithm						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**-**	**-**	**4**	**75**	**25**	**100**	**3 hrs**
Purpose	To make the students understand the concept of Genetic Algorithm.						
COURSE OUTCOMES							
CO1	An overview about Genetic Algorithm.						
CO2	Understand the working of Genetic Algorithm in models.						
CO3	Understand Theoretical foundation.						
CO4	To understand application of fuzzy set theory and control.						

UNIT-I

Genetic Algorithms: Overview, Brief History, Biological Terminology, Search Spaces And Fitness Landscapes, Elements Of Genetic Algorithms, Examples Of Fitness Functions, Ga Operators, A Simple Genetic Algorithm, Genetic Algorithms And Traditional Search Methods, Two Brief Examples, How Do Genetic Algorithms Work?

UNIT-II

Genetic Algorithms In Problem Solving: Evolving Computer Programs, Data Analysis And Prediction, Evolving Neural Networks **Genetic Algorithms In Scientific Models:** Modeling Interactions Between Learning And Evolution, Modeling Sexual Selection, Modeling Ecosystems, Measuring Evolutionary Activity

UNIT-III

Theoretical Foundations Of Genetic Algorithms: Schemas And The Two−Armed Bandit Problem, Royal Roads- Royal Road Functions, Experimental Results, Steepest−Ascent Hill Climbing (Sahc), Next−Ascent Hill Climbing (Nahc), Random−Mutation Hill Climbing (Rmhc), Analysis Of Random−Mutation Hill Climbing, Hitchhiking In The Genetic Algorithm, An Idealized Genetic Algorithm, Exact Mathematical Models Of Simple Genetic Algorithms, Statistical−Mechanics Approaches.

UNIT-IV

When Should A Genetic Algorithm Be Used?, Encoding A Problem For A Genetic Algorithm, Adapting The Encoding, Selection Methods, Genetic Operators, Parameters For Genetic Algorithms.

References:

1. Mitchell Melanie, 'An Introduction to Genetic Algorithms'
2. David Edward Goldberg, 'Genetic Algorithms in Search, Optimization, and Machine Learning'.

PE-AI-DS-T305A	Application of Data Science in Industry						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**-**	**-**	**4**	**75**	**25**	**100**	**3 hrs**
Purpose	To make the students understand the concept of Application Of Data Science in Industry.						
COURSE OUTCOMES							
CO1	Provide with the knowledge and expertise to become a proficient data scientist.						
CO2	Explain how data is collected, managed and stored for data science.						
CO3	Critically evaluate data visualizations based on their design and use for communicating stories from data.						
CO4	To understand application of Data Science and Big Data.						

UNIT-I

Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications. Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources.

UNIT-II

Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

UNIT-III

Data visualization: Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.

UNIT-IV

Big Data: Understand Big Data Challenges, Various application in Data Science, What exactly is Data Science and what do Data Scientists do, Data Science contrasted with other disciplines, Case Study & Use Cases. Real world applications- Applications of Machine Learning

References:

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly.
2. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press.

Bachelor of Technology (Artificial Intelligence & Data Science)										
Modified Credit Based Scheme of Studies/Examination										
Semester VI (w.e.f Session 2023-2024)										
S.No.	**Course Code**	**Subject**	**L:T:P**	**Hours/Week**	**Credits**	**Examination Schedule (Marks)**				**Duration of exam (Hrs)**
						Major Test	**Minor Test**	**Practical**	**Total**	
1	AI-DS-302A	Deep and Advanced Machine Learning	4:0:0	4	4	75	25	0	100	3
2	AI-DS-304A	Bio Informatics	4:0:0	4	4	75	25	0	100	3
3	PE	Elective – II	3:0:0	3	3	75	25	0	100	3
4	PE	Elective – III	3:0:0	3	3	75	25	0	100	3
5	OE	Open Elective-I	3:0:0	3	3	75	25	0	100	3
6	PE-AI-DS-LA	Elective - III Lab	0:0:3	3	1.5	--	40	60	100	3
7	AI-DS-306LA	Deep and Advanced Machine Learning Lab	0:0:3	3	1.5	--	40	60	100	3
8	AI-DS-308LA	Unix Lab	0:0:2	2	1	--	40	60	100	3
		Total	**25**	**25**	**21**	**375**	**245**	**180**	**800**	

The course of both PE & OE will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.

PE-II	**PE -III**
Cloud Web Services PE-AI-DS-T310A	High Performance Computing PE-AI-DS-316A
Data Analytics using SQL PE-AI-DS-T312A	Human AI Interaction PE-AI-DS-318A
Social Media Analytics PE-AI-DS-T314A	Natural Language Processing PE-AI-DS-320A
OE-I	
Inferential Statistics OE-AI-DS-302A	
Management Information System OE-AI-DS-304A	
Enterprise Resource Planning OE-AI-DS-306A	

AI-DS-302A	Deep and Advanced Machine Learning						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**-**	**-**	**4**	**75**	**25**	**100**	**3 hrs**
Purpose	**To familiarize the students with the Deep and Advanced Machine Learning**						
Course Outcomes(CO)							
CO 1	Different types of machine learning and its utility						
CO 2	Application of Hidden Markov Model and Artificial neural networks to different types of bioinformatics data						
CO 3	Determination of Bayesian Network (BN) from expression data.						
CO 4	Application of stochastic context-free grammar (SCFG) to predict RNA secondary structure.						

UNIT-I

Advanced Machine learning with Tensor Flow: Introduction, Tensor flow operations, declaring tensors, working with metrics, declaring operations, implementing activation functions, operations in computational graph, layering nested operations, working with multiple layers, implementing loss functions, implementing back propagation, working with batch and stochastic training, evaluating models, Implementing unit tests, multiple executors, productionalizing tensor flow

UNIT-II

Reinforcement Learning: Introduction, formal framework, different components to learn a policy, value based methods for RL, Q-learning, fitted Q-learning, Deep Q-networks, double DQN, dueling network architecture, distributional DQN, Multi step learning, concepts of generalization, feature selection, modifying objective function, hierarchical learning, bias-over fitting tradeoff

UNIT- III

Model Evaluation and Hyper-parameter Tuning : Streamlining workflows with pipelines, K-fold cross validation, Model performance measures, debugging algorithms with learning and validation curves, fine-tuning machine learning models via grid search, looking at different performance evaluation metrics, Ranking metrics, Classification metrics, regression metrics, Bootstrapping and Jackknife, Hold-out validation, difference between model validation and testing.

UNIT-IV

Machine Learning Deployment: Serializing fitted scikit – learn estimators, setting up a SQLite database for data storage,developing web application with Flask, turning the classifier into a web application, turning a regression problem into a web application, pickle model, deploying web application to a public server, Cloud deployment using AWS and Google.

Suggested Books:

1. Master Machine Learning Algorithms, Jason Brownlee
2. Deeper Insights into Machine Learning, Birmingham, Packt
3. An Introduction to Deep Reinforcement Learning, Vincent François-Lavet, Peter
4. Henderson,Riashat Islam, Marc G. Bellemare and Joelle Pineau
5. Tensorflow machine learning cookbook, Nick McClure, Packt

AI-DS-304A	Bio Informatics						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**-**	**-**	**4**	**75**	**25**	**100**	**3 hrs**
Purpose	**To provide students the fundamental concepts and methods of Bio Informatics**						
Course Outcomes(CO)							
CO 1	Students will know Different types of Bio Informatics and its utility						
CO 2	Applications of Bio Informatics where it solves different Problems.						
CO 3	Studied Different Structures of DNA and RNA.						
CO 4	Translation, Nucleic acids-Information Storage and Proteins-Information Expression.						

UNIT-I

Introduction to Bio Informatics: Overview of Informatics and Biology, Areas of Biology where BioInformatics helped, How Computers helped in Biology, How Bio Informatics solves different Problems, Protein Sequencing.

UNIT-II

Molecular Biology Data: Introduction , PubMed, Molecular Biology DataBases, Protein Structure Data, DNA,RNA and Protein Sequence data, Genetic Data, Biochemical Pathway Data, Gene Expression Data.

UNIT- III

Nucleic Acids: Basic chemistry of Nucleic acid, Structure of DNA, Base Pairing, RNA Structure, Replication of DNA, Transcription, Translation, Nucleic acids-Information Storage and Proteins-Information Expression

UNIT-IV

Protein Structure, Folding and Function: The Chemistry of Proteins, Secondary Structures of Proteins, Protein Function, Protein Structure, Protein Folding, Nucleic acid Protein Interaction

Suggested Books:

1. Archana Verma, Ebook of Introduction to Bio Informatics, Publisher : Laxmi Publications Pvt Ltd; First edition (12 January 2018)
2. P Baldiand S Brunak, BIOINFORMATICS: The Machine Learning Approach

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

PE-AI-DS-T310A	Cloud Web Services						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 hrs**
Purpose	**To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.**						
Course Outcomes(CO)							
CO 1	Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms						
CO 2	Analyze the Cloud computing setup with its vulnerabilities and applications using different architectures.						
CO 3	Design different workflows according to requirements and apply map reduce programming model.						
CO 4	Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds						

UNIT-I

Introduction to Cloud Computing and Amazon Web Services Introduction to Cloud Computing, Cloud Service Delivery Models (IAAS, PAAS, SAAS), Cloud Deployment Models (Private, Public, Hybrid And Community), Cloud Computing Security,Case Study.

Introduction to Amazon Web Services, Why Amazon? Use Cases, AWS Storage Options, AWS Compute Options, AWS Database Options, AWS Workflow Automation And Orchestration Options, AWS Systems Management And Monitoring Options, AWS Virtual Private Cloud Introduction, Pricing Concepts

UNIT-II

Introduction to EC2: Introduction To EC2, Instance Types And Uses, Autoscaling Instances, Amazon Machine Images (AMIS), Modifying Existing Images, Creating New Images Off Of Running Instances, Converting An Instance Store AMI To An EBS AMI, Instances Backed By Storage Types, Creating A Web Server Using Ec2, Elastics Block Storage (EBS), Elastic IPS, Route 53 DNS System, Cloudfront SNS Pricing

UNIT- III

S3, Cloudwatch, Elastic Beanstalk And Security: Introduction To S3, Buckets And Objects, Security, Creating A Web Server Using S3 Endpoints, Introduction To Cloudwatch, Creating Alarm Notifications, Autoscaling Instances, Deploying Scalable Application On AWS, Selecting And Launching An Application Environment, Provisioning Application Resources with Cloud formation.

Describe Amazon Dynamo, Understand key aspects of Amazon RDS, Launch an Amazon RDS instance, Identify what is Cloud Formation, Describe Amazon Cloud Watch metrics and alarms, Describe Amazon Identity and Access Management (IAM), Security In AWS, IAM (Identity And Access Management), Access Control Lists (ACLs), Securing Data at Rest And In Motion, Security Groups

UNIT-IV

AWS Storage, Elasticity and AWS Networking: Amazon Storage, S3 Storage Basics, Managing Voluminous Information with EBS, Glacier Storage Service, AWS Networking: Networking Basics, VLAN Basics, Basics of AWS VLANs, AWS Network IP Addressing and Mapping

Suggested Books:

1. A Hands-On Guide to the Fundamentals of AWS Cloud 1st Edition, Kindle Edition
2 .Hand Book of Natural Language Processing, Second Edition – NITIN INDURKHYA FREDJ. DAMERAU, CRC Press
3. Mining Text Data - Charu C. Aggarwal, ChengXiangZhai, Springer
4.Text Mining Classification, Clustering, and Applications - Ashok N. Srivastava, Mehran Sahami, CRC Press

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

AI-DS-306LA	Deep and Advanced Machine Learning Lab						
L	**T**	**P**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
-	**-**	**3**	**1.5**	**60**	**40**	**100**	**3 hrs**
Purpose	**To familiarize the students with the advanced deep and machine learning**						
Course Outcomes(CO)							
CO 1	Different types of machine learning and its utility						
CO 2	Application of Hidden Markov Model and Artificial neural networks to different types of bioinformatics data						
CO 3	Determination of Bayesian Network (BN) from expression data.						
CO 4	Application of stochastic context-free grammar (SCFG) to predict RNA secondary structure.						

List of Experiments

1. Build a machine learning model for house price prediction analysis using lasso and ridge regression
2. Build a machine learning model on hand written digits and compare the models using evaluation techniques.
3. Compare the differences between the accuracies obtained using ridge and lasso regression in first experiment
4. For the above build regression model, perform model evaluation, feature selection and parameter tuning
5. Build a classification model on heart disease UCI dataset using ensemble techniques
6. Compare the ensemble models built on heart disease data set and validate the same
7. Build a simple reinforcement learning model and use Montel Carlo learning to find the optimal combination of products using meal data with 4 ingredients and 9 products.
8. Build a Tic –Tac – Toe agent using Q-learning concept
9. Financial Time Series Monte Carlo Simulation on S&P 500 stock data.
10. Deploy a regression model of first experiment using Flask and build a web api on the same
11. Deploy the classification model of third experiment using amazon sage maker or as a pickle model as web api
12. Deploy the classification model of third experiment using Google cloud or as a pickle model as web api

PE-AI-DS-T312A	Data Analytical using SQL						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 hrs**
Purpose	Understand the importance of Data Analytical using SQL						
Course Outcomes(CO)							
CO 1	Explain SQL benefits and its syntax						
CO 2	Apply SQL statements to create, update, delete database objects						
CO 3	Apply SQL queries to retrieve data from tables						
CO 4	Test built-in functions to retrieve data and format						

Unit-1

Introduction to SQL: Introduction to Structure Query Language (SQL), SQL History & Evolution, Features of SQL, Understanding of SQL process, Benefits and Role of SQL along with different market forces, Types of SQL, SQL Standards, SQL and Networking, Centralized architecture, File Server Architecture, Client Server Architecture, Multitier Architecture, Understanding concept for OLAP and OLTP Applications, Difference between OLAP and OLTP, SQL and Database Management, Data warehouse Concept

Unit-2

SQL Statements & Executions: Types of SQL Statement, Data Definition language, Data Control language, Data Manipulation Language, Types of execution, Direct Invocation, Embedded SQL, Module Binding, Call-level interface, Data types, Constants, Numeric Constants, String Constants, Time & date Constants, Symbolic Constants, Expressions, Built in function

Unit-3

Starting with basic SQL Syntax: Types of Tables, Create Database statement, Drop, Use statement, Create table Statement, Drop table Statement, Create index Statement, Drop index Statement, Describe Statement, Truncate Statement, Alter table Statement, Insert INTO Statement, Update, Delete table Statement, Commit Statement, Create SQL Tables, Specify Column data types, Create user Defined Types, Specify Column Default Values, Alter SQL Tables, Updating Data, Using WHERE Clause, Using Logical operations, AND operations, OR operations, Deleting SQL table

Unit-4

Extracting Information & Manipulating Data: Select Statement, Returning only Distinct Rows, Using Aliases, Filtering Results using WHERE Clause, Logical Operations and Operator Precedence, NOT operator, BETWEEN Operator, LIKE Operator, IN Operator, Ordering Results with ORDER BY Understanding SQL Arithmetic, basic Math operations, ABS() function, POWER() function, SQRT() function, RAND() function, CEILING() function, FLOOR() function, ROUND() function, SUBSTRING() function, Case Conversion Functions, REVERSE() function, TRIM() function, LENGTH() function, SOUNDEX() function, DIFFERENCE() function, DATE() function

Reference material

1. Beginning SQL, Paul Wilton and John W. Colby, Published by: Wiley Publishing, Inc.
2. The Complete Reference, James R. Groff and Paul N. Weinberg, McGraw-Hill/Osborne &

   Learning SQL, ALAN Beaulieu, O'REILLY

PE-AI-DS-T314A	Social Media Analytics						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 hrs**
Purpose	To understand the basic concepts and importance social media analytics, procedure for analysing twitter data and access the same through R platform, procedure for analysing Facebook data and access the same through R platform, procedure for analysing Instagram and access the same through R platform and procedure for analysing GitHub data and access the same through R platform.						
Course Outcomes(CO)							
CO 1	Outline the important terminologies and analytics techniques in social media analytics						
CO 2	Analyse the twitter data and conclude the important finding and insights of the society thought on particular issues						
CO 3	Analyse the Facebook data and conclude the important finding and insights of the society thought on particular issues						
CO 4	Analyse the Instagram profile and find out the interesting insights						

Unit-1

Introduction to Social Media Analytics : Social media and its importance, Various social media platforms, Social media mining, Challenges for social media mining, Social media mining techniques: Graph mining and text mining, The generic process of social media mining

Unit-2

Analytics on Twitter: Introduction, Twitter and its importance, Understanding Twitter's APIs: Twitter vocabulary, creating a Twitter API connection: Creating a new app, Finding trending topics, Searching tweets, Twitter sentiment analysis: Collecting tweets as a corpus, Cleaning the corpus, Estimating sentiment.

Unit-3

Analytics on Facebook : Introduction, Creating an app on the Facebook platform, RFacebook package, A basic analysis of your network, Network analysis and visualization, Getting Facebook page data, Trending topics analysis, Influencers: based on single post and multiple post, Measuring CTR performance for a page, Spam detection, Recommendations to friends.

Unit-4

Analytics on Instagram: Definition and overview Instagram, Creating an app on the Instagram platform, Installation and authentication of the install R package, Accessing data from R, Popular personalities, Overall top users, Most viral media, Finding the most popular destination, Locations with most likes, Clustering the pictures, Recommendations to the users.

TextBooks:

1. Mastering Social Media Mining with R– Sharan Kumar Ravindran, Vikram Garg, PACKT Publishing.

ReferenceBooks:

2. Social Media Mining with R - Nathan Danneman, Richard Heimann, PACKT Publishing.

3. Social Media Mining An Introduction - Reza Zafarani, Mohammad Ali Abbasi, Huan Liu, Cambridge University Press.

OE-AI-DS-302A	Inferential Statistics						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 hrs**
Purpose	Explain inferential statistics						
Course Outcomes(CO)							
CO 1	Understanding the inferential statistics, hypotheses testing and type-I and type-II error						
CO 2	Test Hypotheses using parametric and non-parametric test						
CO 3	Apply the likelihood ration for point estimation						
CO 4	Analyzeand estimate the parameters						

Unit-1

Introduction to Statistical Inference: History and development of statistical inference, introduction to statistical hypothesis, types of hypothesis – simple and composite, fundamental concepts of null hypothesis, alternative hypothesis, critical region, two types of statistical errors: type I and II error, importance of type I & II error, level of significance, confidence level and critical region, most powerful test, uniformly most powerful test and their construction, Neyman Pearson Lemma, application and importance of Neyman Pearson Lemma,

Unit-2

Testing of Hypothesis – Parametric Test: Introduction to Testing of hypothesis, steps I nvolved in Hypothesis testing, small sample test : t test for one sample mean and two sample mean, F test for equality of two variances, Large sample test : Z test, single mean, two mean, single proportion and two proportions, test for the variance of normal distribution, test for the equality of two or more than two normal distributions, confidence interval for population arithmetic mean, confidence interval for population variance

Unit-3

Testing of Hypothesis: Non Parametric test: Introduction to non-parametric test, run test, Wilcoxon signed Rank Test, Wilcoxon Matched signed pair rank test, Mann-Whiteney U test, Kruskal Wallis test, Fried Man Rank Test for small sample and large sample, Goodness of fit test and independence of attributes using test.

Unit-4

Parameter Estimation: Introduction to estimation, central limit theorem and its application, types of estimation, properties of good estimator – unbiasedness, consistency, efficiency and sufficiency, Method of estimation – maximum likelihood estimation, properties of method of maximum likelihood estimator

TextBooks:

1. Fundamentals of mathematical statistics – SC Gupta and VK Kapoor, Sultan Chand & Sons Publication, New Delhi

ReferenceBooks:

1. Introduction to probability Models, Ninth Edition – Sheldon M. Ross, Elsevier Publication, Academic Press, UK .
2. An introduction to Probability and Statistical Inference – George Roussas, Academic Press.

OE-AI-DS-304A	Management Information System						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 hrs**
Purpose	To study of people, technology, organizations, and the relationships among Management Information System						
Course Outcomes(CO)							
CO 1	Relate the basic concepts and technologies used in the field of management information systems;						
CO 2	Compare the processes of developing and implementing information systems.						
CO 3	Outline the role of the ethical, social, and security issues of information systems.						
CO 4	Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.						

UNIT – I

Introduction to system and Basic System Concepts, Types of Systems, The Systems Approach, Information System: Definition & Characteristics, Types of information, Role of Information in DecisionMaking, Sub-Systems of an Information system: EDP and MIS management levels, EDP/MIS/DSS.

UNIT –II

An overview of Management Information System: Definition & Characteristics, Components of MIS, Frame Work for Understanding MIS: Information requirements & Levels of Management, Simon's Model of decision-Making, Structured Vs Un-structured decisions, Formal vs. Informal systems.

UNIT – III

Developing Information Systems: Analysis & Design of Information Systems: Implementation & Evaluation, Pitfalls in MIS Development.

UNIT – IV

Functional MIS: A Study of Personnel, Financial and production MIS, Introduction to e-business systems, ecommerce – technologies, applications, Decision support systems – support systems for planning, control and decision-making

TEXT BOOK:

1. J. Kanter, “Management/Information Systems”, PHI.
2. Gordon B. Davis, M. H. Olson, “Management Information Systems – Conceptual foundations, structure and Development”, McGraw Hill.

REFERENCE BOOK:

1. James A. O’Brien, “Management Information Systems”, Tata McGraw-Hill.
2. James A. Senn, “Analysis & Design of Information Systems”, Second edition, McGraw Hill.
3. Robert G. Murdick& Joel E. Ross & James R. Claggett, “Information Systems for Modern Management”, PHI. 4. Lucas, “Analysis, Design & Implementation of Information System”, McGraw Hill.

OE-AI-DS-306A	Enterprise Resource Planning						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 hrs**
Purpose	To make student able to build an understanding of the fundamental concepts of ERP systems, their architecture, and working of different modules in ERP. Students will also able to develop and design the modules used in ERP systems, and can customize the existing modules of ERP systems.						
Course Outcomes(CO)							
CO 1	Develop model for ERP for large projects.						
CO 2	Develop model for E-commerce architecture for any application						
CO 3	Describe the advantages, strategic value, and organizational impact of utilizing an ERP system for the management of information across the functional areas of a business: sales and marketing, accounting and finance, human resource management, and supply chain.						
CO 4	Demonstrate a working knowledge of how data and transactions are integrated in an ERP system to manage the sales order process, production process, and procurement process.						

Unit-I

Introduction to ERP: Overview -Benefits of ERP -ERP and Related Technologies - Business Process Reengineering - Data Warehousing - Data Mining -On-line Analytical Processing -Supply Chain Management.

Unit-II

ERP Implementation: Implementation Life Cycle -Implementation Methodology - Hidden Costs - Organizing Implementation - Vendors, Consultants and UsersContracts-Project Management and Monitoring.

Unit-Ill

Business Modules: Business Modules in an ERP Package-Finance ManufacturingHuman Resource-Plant Maintenance-Materials Management -Quality ManagementSales and Distribution.

Unit-IV

ERP Market - ERP Market Place - SAP AG - PeopleSoft-Baan Company –Oracle Corporation. ERP Present and Future: ERP and E-Commerce-ERP and Internet-Future Directions in ERP.

Recommended Books:

1. Mary Sumner, Enterprise Resource Planning, Pearson Education (2010).
2. Kogent Learning Solutions Inc., SAP ABAP/4 Covers SAP ECC 6.0 Black Book, Dreamtech Press (2009).
3. Bradford M., Modern ERP Systems: Select Implement and Use Today's Advanced Business Systems (2010).
4. Dreamtech Software Team, SAP Architecture, Administration, Basis, ABAP Programming with MM and SD modules, Dreamtech Press (2005).

PE-AI-DS-318A	Human AI Interaction						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 hrs**
Purpose	To stress the importance of a good interface design. To understand the importance of human psychology in designing good interfaces						
Course Outcomes(CO)							
CO 1	Apply key concepts related to HMI in their day to day activities						
CO 2	Having an ability to design and conduct experiments, as well as to analyze and interpret data						
CO 3	Determine how HMI methods may be used in gaming						
CO 4	Identify how encoding methods works						

Unit-1

HCI Foundations : Input–output channels, Human memory, Thinking: reasoning and problem solving, Emotion, Individual differences, Psychology and the design of interactive systems, Text entry devices, Positioning, pointing and drawing, Display devices, Devices for virtual reality and 3D interaction.

Unit-2

Designing Interactions Shneideman's eight golden rules, Norman's Seven principles, Screen Design - Visual Display Layout, Information Structuring and Navigation, HCI in Software process, Design Rules, HCI for Users with Disability, Mobile devices, Earcon design for aural interface

Unit-3

Interaction Design Models Model Human Processor - Working Memory, Long-Term Memory, Processor Timing, Keyboard Level Model - Operators, Encoding Methods, Heuristics for M Operator Placement, What the Keyboard Level Model Does Not Model, Application of the Keyboard Level Model, GOMS - CMNGOMS Analysis, Modeling Structure, State Transition Networks

Unit-4

Interface in HCI Visual Interface, Emotion in HCI, knowledge driven in HCI, Multi-user Interaction, Interface Selection Options, Wire-Framing.

Text Books:

1. Gerard Jounghyun Kim, Human Computer Interaction – Fundamentals and Practice, – CRC press, 2015.
2. Regina Bernhaupt , Game User Experience Evaluation-2015 Edition, Kindle Edition
3 Martin Helander, Handbook of Human-Computer Interaction-1988 Elsevier

References Books:

1 Julie A. Jacko, The Human–Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications, 3rd Edition, CRC Press (Taylor & Francis Group) 2012.
2 Ben Shneiderman, Catherine Plaisant, Maxine Cohen,Steven Jacobs, Designing the User Interface: Strategies for Effective Human Computer Interaction, 5th Edition, Pearson, 2009.
3 Alan Dix, Janet E. Finlay, Gregory D. Abowd, Russell Beale, Human - Computer Interactio3rd Edition, Pearson, 2003.

PE-AI-DS-320A	Natural Language Processing						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 hrs**
Purpose	Familiarize students with how computer systems will be able to understand, draw inferences from, summarize, translate and generate accurate and natural human text and language.						
Course Outcomes(CO)							
CO 1	Understand the key role of syntactic parsing and semantic analysis in natural language processing in unstructured data						
CO 2	Categorize language generation as a part of sentimental analysis.						
CO 3	Evaluate important statistical techniques used in natural language processing						
CO 4	Create corpus for text analysis in natural language processing.						

UNIT I

Introduction to Natural Language Processing: Introduction, terminologies, challenges of text pre-processing, tokenization, sentence segmentation, lexical analysis, finite state morphonology, finite state morphology, morphology vs lexical analysis, paradigm based lexical analysis.

UNIT II

Syntactic Parsing and Semantic Analysis: Syntactic parsing, The Cocke–Kasami–Younger Algorithm, Implementing Deductive Parsing, LR Parsing, Constraint-based Grammars, Natural Language Semantics, Relational Issues in Lexical Semantics, Fine-Grained Lexical-Semantic Analysis.

UNIT III

Natural Language Generation: Introduction, The Components of a Generator, Text Planning, Pushing vs. Pulling, Planning by Progressive Refinement of the Speaker's Message, Text Schemas, The Linguistic Component, Relationship to Linguistic Theory, Chunk Size, Assembling vs. Navigating, Systemic Grammars, Functional Unification Grammars.

UNIT IV

Corpus Creation: Introduction and definition of corpus in natural language processing, corpus size, Balance, Representativeness, and Sampling, Data Capture and Copyright, Corpus Markup and Annotation, Multilingual Corpora, Multimodal Corpora, Corpus Annotation Types, Morphosyntactic Annotation, Treebanks: Syntactic, Semantic, and Discourse Annotation, The Process of Building Treebanks.

Text Books:

1. Hand Book of Natural Language Processing, Second Edition – NITIN INDURKHYA FRED J. DAMERAU, CRC Press
2. Mining Text Data - Charu C. Aggarwal, ChengXiangZhai, Springer
3. Text Mining Classification, Clustering, and Applications - Ashok N. Srivastava, Mehran Sahami, CRC Press.

PE-AI-DS-316A	High Performance Computing						
L	**T**	**P**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 hrs**
Purpose	To Study various computing technology architecture..						
Course Outcomes(CO)							
CO 1	Basic knowledge of computing technology.						
CO 2	Student will be able to understand architecture of computing technology.						
CO 3	Student will be able to know cloud computing service models						
CO 4	Student will know about emerging trends in computing technology						

Unit-1

Cluster Computing and its Architecture: Ease of Computing, Scalable Parallel Computer Architecture, Towards Low Cost Parallel Computing & Motivation, Windows opportunity, A Cluster Computer And Its Architecture

Cluster Classification, Commodity Components for Clusters, Network Services/Communication SW, Cluster Middleware and Single Systems Image, Resource management & Scheduling (RMS)

Unit-2

Cluster Setup and Administration: Introduction, Setting up the cluster, Security, System Monitoring, System Tuning, Introduction to Grid and its Evolution:, Beginning of the Grid, Building blocks of Grid, Grid Application and Grid Middleware, Evolution of the Grid: First, Second & Third Generation

Unit-3

Introduction to Cloud Computing: Defining Clouds, Cloud Providers, Consuming Cloud Services, Cloud Models – Iaas, Paas, SaaS, Inside the cloud, Administering cloud services, Technical interface, Cloud resources

Unit-4

Nature of Cloud: Tradition Data Center, Cost of Cloud Data Center, Scaling computer systems, Cloud work load Managing data on clouds, Public, private and hybrid clouds

TEXT BOOKS:

1. High Performance Cluster Computing, Volume 1, Architecture and Systems, Rajkumar Buyya, Pearson Education.
2. Berman, Fox and Hey, Grid Computing – Making the Global Infrastructure a Reality, Wiley India.
3. Hurwitz, Bllor, Kaufman, Halper, Cloud Computing for Dummies, Wiley India.

REFERENCE BOOKS:

1. Ronald Krutz, Cloud Security, Wiley India.
2. Cloud Computing, A Practical Approach, Anthony Velte, Toby Velte, Robert Elsenpeter, McGrawHill.

PE-AI-DS-316LA	High Performance Computing Lab						
L	**T**	**P**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
0	**0**	**3**	**1.5**	**60**	**40**	**100**	**3 hrs**
Purpose	To Study various Language Processing Techniques.						
Course Outcomes(CO)							
CO 1	Student will learn capabilities and limitations of current natural language technologies						
CO 2	Student will do model linguistic phenomemna with formal grammars.						
CO 3	Student will able to design, implement, and test algorithms for NLP problems.						
CO 4	Student will apply NLP techniques to design real world NLP applications.						

LIST OF PRACTICALS:

1 Study and implementation of Processing Text(Word and Sentence tokenization)
2 Study and implementation of Morphological analysis(Stop word removal)
3 Study and implementation of Stemming and Lemmatization.
4 Study and implementation of POS Tagging and Chunking in a sentence
5 Study and implementation of NER(Name entity Recognition)
6 Study and implementation of N-Gram Language Model.
7 Study Wordnet-Lesk Aalgorithm.
8 CASE STUDY:Application of NLP –Sentiment Analysis of tweets in twitter platform.

AI-DS-308LA	UNIX Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
-	**-**	**2**	**1**	**40**	**60**	**100**	**3 Hrs.**
Purpose	Experimental knowledge of programming skills with expertisation on Unix/Linux platform						
Course Outcomes(CO)							
CO1	Learning of simple and advanced commands of Unix /Linux operating systems.						
CO2	Develop shell programming using Bash or any other shell scripts.						
CO3	Develop advanced shell programming skills.						
CO4	Analyzing & evaluation of performance of various c language based programs with the help of Make file & debug utilities.						
CO5	Creation of user accounts, Learning of package installation, backup and shutdown process on Unix /Linux operating systems.						

List of Practical

1. Familiarize with Unix/Linux Log In/Log Out and various other commands &vi editor.
2. Develop simple shell programs using Bash or any other shell in Linux.
3. Develop advanced shell programs using grep, fgrep&egrep.
4. Compile and debug various C language based programs using 'makefile' & 'debug' utility.
5. Learning of installation of dual operating systems with Linux having previously installed other window based operating system. Both OSs should be in working operating mode.
6. As Supervisor create and maintain user accounts, learn package installation, taking backups, creation of scripts for file and user management, creation of startup and shutdown scripts using at, batch, cron etc.

NOTE : At least 8 to 12 more programs exercises based on Unix/Linux platform are to be assigned by the concerned teacher.

PE-AI-DS-320LA	Natural Language Processing Lab						
L	**T**	**P**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
0	**0**	**3**	**1.5**	**60**	**40**	**100**	**3 hrs**
Purpose	To Study various Language Processing Techniques.						
Course Outcomes(CO)							
CO 1	Student will learn capabilities and limitations of current natural language technologies						
CO 2	Student will do model linguistic phenomemna with formal grammars.						
CO 3	Student will able to design, implement, and test algorithms for NLP problems.						
CO 4	Student will apply NLP techniques to design real world NLP applications.						

LIST OF PRACTICALS:

1 Study and implementation of Processing Text(Word and Sentence tokenization)
2 Study and implementation of Morphological analysis(Stop word removal)
3 Study and implementation of Stemming and Lemmatization.
4 Study and implementation of POS Tagging and Chunking in a sentence
5 Study and implementation of NER(Name entity Recognition)
6 Study and implementation of N-Gram Language Model.
7 Study Wordnet-Lesk Aalgorithm.
8 CASE STUDY:Application of NLP –Sentiment Analysis of tweets in twitter platform.

PE-AI-DS-318LA	Human AI Interaction Lab						
L	**T**	**P**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
0	**0**	**3**	**1.5**	**60**	**40**	**100**	**3 hrs**
Purpose	To Study various Human AI Interaction Techniques.						
Course Outcomes(CO)							
CO 1	To Understand the concept of Artificial intelligence.						
CO 2	To apply knowledge representation and reasoning techniques.						
CO 3	To understand & apply different types of machine learning and models.						
CO 4	To understand the design principles of pattern recognition with estimation and apply classification technique						

LIST OF PRACTICALS:

1 Write a program in prolog to implement simple facts and Queries
2 Write a program in prolog to implement simple arithmetic
3 Write a program in prolog to solve Monkey banana problem
4 Write a program in prolog to solve Tower of Hanoi
5 Write a program in prolog to solve 8 Puzzle problems
6 Write a program in prolog to solve 4-Queens problem
7 Write a program in prolog to solve Traveling salesman problem
8 Write a program in prolog for Water jug problem
9. Write a program to implement a Tic-Tac-Toe game.
10.Write a python program to implement simple Chatbot?