

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)**

**B. Tech - Artificial Intelligence & Data Science (AI & DS)
(Effective for the batches admitted from 2020-21)**

Semester VI (Third year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	PC	20APC3020	Big Data Analytics	3	1	0	3	30	70	100
2	PC	20APC3022	Machine Learning	3	0	0	3	30	70	100
3	PC	20APC3024	Cloud Computing	3	0	0	3	30	70	100
4	PE - 2	20APE3004	Software Engineering for AI	3	0	0	3	30	70	100
		20APE3005	Game Programming	3	0	0				
		20APE3006	Introduction To NoSQL Database	3	0	0				
5	OE - 2 (MOOCS-1) NPTEL*		Introduction to robotics Design, Technology and Innovation Introduction to Smart Grid Introduction to Wireless and Cellular Communications Stochastic control and communication Real-Time Digital Signal Processing VLSI Interconnects Developing Soft Skills and Personality Body language: Key to professional Success Psychology of Everyday Educational Leadership Entrepreneurship And IP Strategy Globalization And Culture Consumer Psychology Public Speaking Project Management Training Of Trainers Decision-Making Under Uncertainty Game Theory Organizational Behavior Customer Relationship Management Decision Support System For Managers Stress Management				3	-	-	100
6	PC LAB	20APC3021	Big Data Analytics Lab	0	0	3	1.5	30	70	100
7	PC LAB	20APC3023	Machine Learning Lab	0	0	3	1.5	30	70	100
8	PC LAB	20APC3025	Cloud Computing Lab	0	0	3	1.5	30	70	100
9	SC	20ASA0502	Soft Skills	1	0	2	2	100	0	100
10	Mandatory Course (AICTE Suggested)	20AHS9902	Professional Ethics and Human Values	2	0	0	0	30	0	30
Total credits							21.5	370	490	930

Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)	0	0	0	3	0	0	0
Industrial/Research Internship (Mandatory) 2 Months during summer vacation							

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI(AUTONOMOUS)

Year: III	Semester: II	Branch of Study: AI & DS			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC3020	Big Data Analytics	3	1	0	3

Course Outcomes

Upon completion of the course, the students should be able to:

CO1: Explain the concepts and challenges of big data

CO2: Determine why existing technologies are inadequate to analyze the large data.

CO3: Outline the operations viz. Collect, manage, store, query, and analyze various forms of big data.

CO4: Apply large-scale analytic tools to solve some of the open big data problems.

CO5: Analyze the impact of big data for business decisions and strategies.

CO6: Design different big data applications.

UNIT - 1:

Introduction to Big Data: What is Big Data? Why Big Data is Important? Meet Hadoop, Data, Data Storage and Analysis, Comparison with other systems, History of Apache Hadoop, Hadoop Ecosystem, VMWare Installation of Hadoop. Analyzing the Data with Hadoop, Scaling Out.

UNIT - 2:

HDFS: The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop File systems, The Java Interface, Data flow.

MapReduce: Developing a MapReduce application, The Configuration API, Setting up the Development Environment, Running Locally on Test Data, Running on a Cluster

UNIT - 3:

How MapReduce Works: Anatomy of a MapReduce, Job Run, Failures, Shuffle and Sort, Task Execution.

MapReduce Types and Formats: MapReduce Types, Input formats, output formats.

UNIT - 4:

Hadoop Environment: Setting up a Hadoop Cluster, Cluster specification, Cluster Setup and Installation, Hadoop Configuration, Security.

Pig: Installing and Running Pig, an Example, Comparison with Databases, Pig Latin, User- Defined Functions, Data Processing Operators.

UNIT - 5:

Hive: Installing Hive, Running Hive, Comparison with traditional Databases, HiveQL, Tables, Querying Data.

Spark: Installing Spark, Resilient Distributed Datasets, Shared Variables, Anatomy of a Spark Job Run.

HBase: HBasics, Installation, clients, Building an Online Query Application.

Text Books:

1. Tom White, "Hadoop: The Definitive Guide" Fourth Edition, O'reilly Media, 2015.
2. Big Data, Big Analytics: Emerging business intelligence and analytic trends for today's businesses, Michael Minnelli, Michelle Chambers, and Ambiga Dhiraj, Wiley Cio Series

Reference Books:

1. Glenn J. Myatt, Making Sense of Data , John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O'Reilly, 2011.
2. Michael Berthold, David J.Hand, Intelligent Data Analysis, Spingers, 2007.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, Understanding Big Data : Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill Publishing, 2012.
4. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets Cambridge University Press, 2012.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO 1	3	2	2										3	2
CO 2	3	2	2										3	2
CO 3	3	2	2										3	
CO 4	2	3	2										2	
CO 5	2	2	2											

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI(AUTONOMOUS)

Year: III		Semester: II		Branch of Study: AI & DS		
COURSE CODE	COURSE TITLE	L	T	P	CREDITS	
20APC3022	Machine Learning	3	0	0	3	

Course Outcomes

- CO1:** Ability to understand what is learning and why it is essential to the design of intelligent machines.
- CO2:** Ability to design and implement various machine learning algorithms in a wide range of real-world applications.
- CO3:** Acquire knowledge deep learning and be able to implement deep learning models for language, vision, speech, decision making, and more
- CO4:** Ability to demonstrate feature selection and dimensionality reduction
- CO5:** Ability to solve decision making problems using SVM(Support Vector Machines) and graphical models

UNIT - 1:

What is Machine Learning?, Examples of machine learning applications, **supervised Learning:** learning a class from examples, Vapnik- Chervonenkis dimension, probably approximately correct learning, noise, learning multiple classes, regression, model selection and generalization, dimensions of a supervised machine learning algorithm. **Decision Tree Learning:** Introduction, Decisions Tree representation, Appropriate problems for decision tree learning, the basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, issues in decision tree learning, **Artificial Neural Networks:** Introduction, Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithm, Remarks on the BACKPROPAGATION Algorithm, An illustrative Example: Face Recognition, Advanced Topics in Artificial Neural Networks.

UNIT - 2:

Evaluating Hypotheses: Motivation, Estimating hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, differences in error of two hypothesis, comparing learning algorithms, **Bayesian Learning:** Introduction, Bayes Theorem, Bayes Theorem and Concept Learning, Maximum Likelihood and least squared error hypothesis, Maximum Likelihood hypothesis for predicting probabilities, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm , Naïve Bayes Classifier , Bayesian Belief Network, EM Algorithm

UNIT - 3:

Dimensionality Reduction: Introduction, Subset selection, principle component analysis, feature embedding, factor analysis, singular value decomposition and matrix factorization, multidimensional scaling, linear discriminant analysis, canonical correlation analysis, Isomap, Locally linear embedding, laplacian eigenmaps, **Clustering:** Introduction, Mixture densities, K- Means clustering, Expectations- Maximization algorithm, Mixture of latent variable models, supervised learning after clustering, spectral clustering, Hierarchical clustering, Choosing the number of clusters.

UNIT - 4:

Linear Discrimination: Introduction, Generalizing the linear model, geometry of the linear discrimination, pair wise separation, parametric discrimination revisited, gradient descent, logistic discrimination, discrimination by regression, learning to rank, **Multilayer Perceptrons:** Introduction, the perceptron, training a perceptron, learning Boolean functions, multilayer perceptrons, MLP as a universal approximator, Back propagation algorithm, Training procedures, Tuning the network size, Bayesian view of learning, dimensionality reduction, learning time, deep learning

UNIT - 5:

Kernel Machines: Introduction, Optimal separating hyperplane, the non separable case: Soft Margin Hyperplane, v-SVM, kernel Trick, Vectorial kernels, defining kernels, multiple kernel learning, multicast kernel machines, kernel machines for regression, kernel machines for ranking, one-class kernel machines, large margin nearest neighbor classifier, kernel dimensionality reduction, **Graphical models:** Introduction, Canonical cases for conditional independence, generative models, d separation, belief propagation, undirected Graphs: Markov Random files, Learning the structure of a graphical model, influence diagrams.

Text Books:

1. Machine Learning – Tom M. Mitchell - 2017 ,McGraw Hill Education
2. Introduction to Machine learning, Ethem Alpaydin, PHI, 3rd Edition, 2014.

Reference Books:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis Chapman and Hall/CRC; 2nd edition, 2014
2. Machine Learning For Beginners: A Comprehensive Guide To Understand Machine Learning. How It Works And How Is Correlated To Artificial Intelligence And Deep Learning, Chris Neil, Alicex Ltd, 2020.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	2	2	2	2							2	3	2
CO2	3	2	2	2	2							2	3	2
CO3	3	2	2	2								2	3	
CO4	2	3	2	2								2	2	
CO5	2	2	2											

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI(AUTONOMOUS)

Year: III		Semester: II		Branch of Study: AI & DS		
COURSE CODE	COURSE TITLE	L	T	P	CREDITS	
20APC3024	Cloud Computing	3	0	0	3	

Course Outcomes:

Upon successful completion of the course, the students will be able to:

CO1: Understand the concept of cloud computing

CO2: Ability to understand various service delivery models and Cloud Computing Architecture.

CO3: Analyze the need for virtualization in a cloud environment.

CO4: Demonstrate the map reducing programming model to process the Big Data along with Hadoop tools

CO5: Analyze authentication, confidentiality, privacy issues and disaster management

UNIT - 1:

Introduction to Cloud: Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, Characteristics and Benefits, A Closer Look, Cloud Computing Reference Model, Challenges Ahead, Historical Developments, Applications of cloud computing: Healthcare, energy systems, transportation, manufacturing, education, government, mobile communication, application development.

UNIT - 2:

Cloud Computing Architecture: Introduction, NIST reference architecture, Cloud Reference Model, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Interoperability and Standards, Scalability and Fault Tolerance

UNIT - 3:

Virtualization: Introduction to Virtualization concept & Hypervisors, Pros and Cons of Virtualization, Virtual Machine (VM), implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Types of Hypervisors, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

UNIT - 4:

Programming Model: Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Design of Hadoop file system, HDFS concepts, dataflow of File read & File write, map reduce applications

Cloud Platforms in Industry: Amazon Web Services- Compute Services, Storage Services.

UNIT - 5:

Cloud Security & Disaster Recovery: Cloud Security: Risks, privacy and privacy impacts assessments; Multi-tenancy issues, security in VM, OS, virtualization system security issues and vulnerabilities; Virtualization system-specific attacks: Technologies for virtualization-based security enhancement, legal.

Disaster Recovery: Disasters in the Cloud, Disaster Management, Compromise Response Disaster Recovery

Text Books:

1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi from TMH 2013.
2. George Reese Cloud Application Architectures, First Edition, O'Reilly Media 2009.
3. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.

Reference Books:

1. Cloud Computing and SOA Convergence in Your Enterprise A Step-by-Step Guide by David S. Linthicum from Pearson 2010.
2. Cloud Computing 2 nd Edition by Dr. Kumar Saurabh from Wiley India 2012.
3. Cloud Computing – web based Applications that change the way you work and collaborate Online – Micheal Miller. Pearson Education.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1									2	1	
CO2	3	2	1		2								2	1
CO3	2	3	2										2	
CO4	2	1	2	1	2							1	2	2
CO5	2	2				2		2				1	2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI(AUTONOMOUS)

Year: III		Semester: II		Branch of Study: AI & DS		
COURSE CODE	COURSE TITLE	L	T	P	CREDITS	
20APE3004	Software Engineering for AI	3	0	0	3	

Course Outcomes

- CO1:** Understand the methods and issues in software engineering
- CO2:** Apply the principles of Artificial Intelligence for Software engineering
- CO3:** Design AI based software
- CO4:** Apply the algorithms of Machine learning in solving problems
- CO5:** Design Expert systems

UNIT – 1: Introduction to Computer Software for AI, AI Problems and Conventional SE Problems, Software Engineering Methodology

Computers and software systems, An introduction to Software engineering, Bridges and buildings versus software systems, the software crisis, A demand for more software power, Responsiveness to human users, Software systems in new types of domains, Responsiveness to dynamic usage environments, Software systems with self-maintenance capabilities, A need for AI systems

What is an AI problem, Ill-defined specifications, correct versus 'good enough' solutions, It's the HOW not the WHAT, the problem of dynamics, the quality of modular approximations, Context-free problems?

Specify and verify—the SAV methodology, the myth of complete specification, what is verifiable, Specify and test—the SAT methodology, testing for reliability, the strengths, the weaknesses, what are the requirements for testing, what's in a specification, Prototyping as a link.

UNIT – 2: An Incremental and Exploratory Methodology, New Paradigms for System Engineering

Classical methodology and AI problems, The RUDE cycle, how do we start, Malleable software, AI muscles on a conventional skeleton How do we proceed, how do we finish, The question of hacking, Conventional paradigms Automatic programming, Transformational implementation, The "new paradigm" of Blazer, Cheatham and Green, Operational requirements of Kowalski, The POLITE methodology

UNIT –3: Towards a Discipline of Exploratory Programming, Machine Learning: Much Promise, Many Problems

Reverse engineering, Reusable software Design knowledge, Stepwise abstraction, The problem of decompiling, Controlled modification, Structured growth
Self-adaptive software, The promise of increased software power, The threat of increased software problems

UNIT – 4: Machine Learning and Expert Systems

Practical machine learning examples, Multisession inductive programming, Expert Systems: The Success Story, Expert systems as AI software, Engineering expert systems, The lessons of expert systems for engineering AI software

UNIT – 5: AI into Practical Software

Support environments, Reduction of effective complexity, Moderately stupid assistance, An engineering toolbox, Self-reflective software, Over engineering software, Summary and What the Future Holds

TEXT BOOKS:

1. Derek Partridge, “Artificial Intelligence and Software Engineering”, Glenlake Publishing Company, 1998.

REFERENCES:

1. " The role of Artificial Intelligence in Software Engineering", K. Nitalksheswara Rao,2020
2. "Farid Meziane &Sunil Vadera, “Artificial Intelligence Applications for Improved Software Engineering Development”, Information Science Reference, 2009

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			2							2	3	2
CO2	3	2			2							2	3	2
CO3	3	2										2	3	
CO4	2	3	2	2								2	2	
CO5	2	2	2											

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI(AUTONOMOUS)

Year: III		Semester: II		Branch of Study: AI & DS		
COURSE CODE	COURSE TITLE	L	T	P	CREDITS	
20APE3005	Game Programming	3	0	0	3	

Course Outcomes

Upon completion of the course, students will be able to

- CO1:** Discuss the concepts of Game design and development.
- CO2:** Design the processes, and use mechanics for game development.
- CO3:** Explain the Core architectures of Game Programming.
- CO4:** Use Game programming platforms, frame works and engines.
- CO5:** Create interactive Games.

UNIT - 1:

3D GRAPHICS FOR GAME PROGRAMMING: 3D Transformations, Quaternions, 3D Modeling and Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera and Projections, Culling and Clipping, Character Animation, Physics-based Simulation, Scene Graphs.

UNIT - 2:

GAME ENGINE DESIGN: Game engine architecture, Engine support systems, Resources and File systems, Game loop and real-time simulation, Human Interface devices, Collision and rigid body dynamics, Game profiling.

UNIT - 3:

GAME PROGRAMMING: Application layer, Game logic, Game views, managing memory, controlling the main loop, loading and caching game data, User Interface management, Game event management.

UNIT - 4:

GAMING PLATFORMS AND FRAMEWORKS: 2D and 3D Game development using Flash, DirectX, Java, Python, Game engines - Unity. DX Studio,

UNIT - 5:

GAME DEVELOPMENT: Developing 2D and 3D interactive games using DirectX or Python – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games

Text Books:

1. Mike Mc Shaffrfy and David Graham, "Game Coding Complete", Fourth Edition, Cengage Learning, PTR, 2012.
2. Jason Gregory, "Game Engine Architecture", CRC Press / A K Peters, 2009.
3. David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics" 2 nd Editions, Morgan Kaufmann, 2006.

Reference Books:

1. Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", 2 nd Edition Prentice Hall / New Riders, 2009.
2. Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", 3 rd Edition, Course Technology PTR, 2011.
3. Jesse Schell, The Art of Game Design: A book of lenses, 1 st Edition, CRC Press, 2008.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2										3	2
CO2	3	2	2										3	2
CO3	3	2	2	2								2	3	
CO4	2	3	2	2								2	2	
CO5	2	2	2											

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI(AUTONOMOUS)

Year: III		Semester: II		Branch of Study: AI & DS	
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APE3006	Introduction To NoSQL Database	3	0	0	3

Course Outcomes

- CO1:** Explain and compare different types of NoSQL Databases
- CO2:** Compare and contrast RDBMS with different NoSQL databases.
- CO3:** Demonstrate the detailed architecture and performance tune of Document-oriented NoSQL databases.
- CO4:** Explain performance tune of Key-Value Pair NoSQL databases.
- CO5:** Apply NoSQL development tools on different types of NoSQL Databases

UNIT - 1:

Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points.

UNIT - 2:

Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, Map Reduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

UNIT - 3:

NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

UNIT - 4:

Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

UNIT - 5:

NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.

Text Books:

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley

Publications,1st Edition ,2019.

WEB REFERENCES:

1. <https://www.ibm.com/cloud/learn/nosql-databases>
2. <https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp>
3. <https://www.geeksforgeeks.org/introduction-to-nosql/>
4. <https://www.javatpoint.com/nosql-databa>

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	2	2	2										2
CO2	3	2	2	2										2
CO3	3	2	2	2										
CO4	2	3	2	2								2	2	
CO5	2	2	2											

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI(AUTONOMOUS)

Year: III		Semester: II		Branch of Study: AI & DS		
COURSE CODE	COURSE TITLE	L	T	P	CREDITS	
20APC3021	Big Data Analytics Lab	0	0	3	1.5	

Course Outcomes:

- CO1:** Configure Hadoop and perform File Management Tasks
- CO2:** Apply MapReduce programs to real time issues like word count, weather dataset and sales of a company
- CO3:** Critically analyze huge data set using Hadoop distributed file systems and MapReduce
- CO4:** Apply different data processing tools like Pig, Hive and Spark.

List of Tasks

1. Install Apache Hadoop
2. Develop a MapReduce program to calculate the frequency of a given word in a given file.
3. Develop a MapReduce program to find the maximum temperature in each year.
4. Develop a MapReduce program to find the grades of student's.
5. Develop a MapReduce program to implement Matrix Multiplication.
6. Develop a MapReduce to find the maximum electrical consumption in each year given electrical consumption for each month in each year.
7. Develop a MapReduce to analyze weather data set and print whether the day is shinny or cool day.
8. Develop a MapReduce program to find the number of products sold in each country by considering sales data containing fields like

Tranction _Date	Prod uct	Price	Payment _Type	Name	City	State	Country	Account _ Created	Last _Login	Latitude	Longi tude
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9. Develop a MapReduce program to find the tags associated with each movie by analyzing movie lens data.
10. XYZ.com is an online music website where users listen to various tracks, the data gets collected which is given below. The data is coming in log files and looks like as shown below.

Userld	TrackId	Shared	Radio	Skip
111115	222	0	1	0
111113	225	1	0	0
111117	223	0	1	1
111115	225	1	0	0

11. Develop a MapReduce program to find the frequency of books published each year and find in which year maximum number of books were published using the following data.

Title	Author	Published year	Author country	Language	No of pages
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12. Develop a MapReduce program to analyze Titanic ship data and to find the average age of the people (both male

and female) who died in the tragedy. How many persons are survived in each class.

The titanic data will be..

Column 1 :PassengerId Column 2 : Survived (survived=0 &died=1)

Column 3 :Pclass Column 4 : Name

Column 5 : Sex Column 6 : Age

Column 7 :SibSp Column 8 :Parch

Column 9 : Ticket Column 10 : Fare

Column 11 :Cabin Column 12 : Embarked

13.Develop a MapReduce program to analyze Uber data set to find the days on which each basement has more trips using the following dataset.

The Uber dataset consists of four columns they are

dispatching_base_number	date	active_vehicles	trips
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14. Develop a program to calculate the maximum recorded temperature by yearwise for the weather dataset in Pig

Latin

15. Write queries to sort and aggregate the data in a table using HiveQL.

16.Develop a Java application to find the maximum temperature using Spark.

Text Books:

1. Tom White, "Hadoop: The Definitive Guide" Fourth Edition, O'reilly Media, 2015.

Reference Books:

1. Glenn J. Myatt, Making Sense of Data , John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O'Reilly, 2011.
2. Michael Berthold, David J.Hand, Intelligent Data Analysis, Spingers, 2007.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, Uderstanding Big Data : Analytics for Enterprise Class Hadoop and Streaming Data, McGrawHill Publishing, 2012.
4. AnandRajaraman and Jeffrey David Ullman, Mining of Massive Datasets Cambridge University Press, 2012

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	2	2											2
CO2	3	2	2											2
CO3	3	2	2											
CO4	2	3	2	2								2	2	
CO5	2	2	2											

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Year: III		Semester: II		Branch of Study: AI & DS	
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC3023	Machine Learning Lab	0	0	3	1.5

Course Outcomes:

CO1: Implement procedures for the machine learning algorithms

CO2: Design Python programs for various Learning algorithms

CO3: Apply appropriate data sets to the Machine Learning algorithms

CO4: Identify and apply Machine Learning algorithms to solve real world problems

List of Tasks

- Exercises to solve the real-world problems using the following machine learning methods:
 - Linear Regression
 - Logistic Regression.
- Write a program to Implement Support Vector Machines.
- Exploratory Data Analysis for Classification using Pandas and Matplotlib.
- Implement a program for Bias, Variance, and Cross Validation.
- Write a program to simulate a perception network for pattern classification and function approximation.
- 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.
- Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
- Write a program to implement the naïve Bayesian classifier for Iris data set. Compute the accuracy of the classifier, considering few test data sets.
- 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.
- Apply EM algorithm to cluster a Heart Disease Data Set. 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.
- Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.
- Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
- 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.
- 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.
- Solve optimal relay coordination as a linear programming problem using Genetic Algorithm.

Text Books:

- Machine Learning – Tom M. Mitchell - 2017 ,McGraw Hill Education

2. Introduction to Machine learning, Ethem Alpaydin, PHI, 3rd Edition, 2014.

Reference Books:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis Chapman and Hall/CRC; 2nd edition, 2014
2. Machine Learning For Beginners: A Comprehensive Guide To Understand Machine Learning. How It Works And How Is Correlated To Artificial Intelligence And Deep Learning, Chris Neil, Alicex Ltd, 2020

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	2	2	2	2							2	3	2
CO2	3												3	2
CO3	3	2	2	2								2	3	
CO4	2	3	2	2								2	2	
CO5	2	2	2											

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI(AUTONOMOUS)

Year: III	Semester: II	Branch of Study: AI & DS			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20APC3025	Cloud Computing Lab	0	0	3	1.5

Course Outcomes:

CO1: Ability to understand various service delivery models of a cloud computing architecture.

CO2: Summarize the Services and Platform of cloud.

CO3: Configure various virtualization tools.

CO4: Explore the future trends of cloud computing.

CO5: Develop Hadoop Applications.3

List of Tasks

1. To study in detail about cloud computing.
2. Working of Google Drive to make spreadsheet and notes.
3. Installation and Configuration of Justcloud.
4. Working in Cloud9 to demonstrate different language.
5. Install Google App Engine. Create hello world app and other simple web applications using python/java.
6. Deployment and Configuration options in Google Cloud
7. Install Virtual box/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
8. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
9. Install Hadoop single node setup
10. Develop hadoop application to count no of characters, no of words and each character frequency

Programs on SaaS

11. Create an word document of your class time table and store locally and on the cloud with doc,and pdf format . (use www.zoho.com anddocs.google.com).
12. Create a spread sheet which contains employee salary information and calculate gross and total sal using the formula DA=10% OF BASIC HRA=30% OF BASIC PF=10% OF BASIC IF BASIC<=3000 12% OF BASIC IF BASIC>3000 TAX=10% OF BASIC IF BASIC<=1500 =11% OF BASIC IF BASIC>1500 AND BASIC<=2500 =12% OF BASIC IF BASIC>2500 (use www.zoho.com and docs.google.com) NET_SALARY=BASIC_SALARY+DA+HRA-PF-TAX
13. Prepare a ppt on cloud computing –introduction , models, services ,andarchitecture Ppt should contain explanations, images and at least 20 pages (use www.zoho.com and docs.google.com).
14. Create your resume in a neat format using google and zoho cloud.

Programs on PaaS

15. Write a Google app engine program to generate n even numbers and deploy it to google cloud.
16. Google app engine program multiply two matrices.
17. Write a Google app engine program to display nth largest no from the given list of numbers and deploy it into google cloud.

Reference Books:

1. spoken-tutorial.org
2. Bart Jacob (Editor), –Introduction to Grid Computing, IBM Red Books, Vervante, 2005
3. Ian Foster, Carl Kesselman, –The Grid: Blueprint for a New Computing Infrastructure,
4. 2nd Edition, Morgan Kaufmann

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3												2	
CO2	2				1									
CO3	2				3									1
CO4	2		2		1							1	1	
CO5	1				1									

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI(AUTONOMOUS)

Year: III	Semester: II	Branch of Study: AI & DS			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ASA0502	SOFT SKILLS	1	0	2	2

Course Outcomes:

Upon completion of the course, the students should be able to:

- CO1:** Recognize the importance of verbal and non verbal skills
- CO2:** Develop the interpersonal and intrapersonal skills
- CO3:** Apply grammatical structures to formulate sentences and correct word forms.
- CO4:** Create trust among people and develop employability skills
- CO5:** Identify and apply communication skills effectively for professional

UNIT – I: OVERVIEW OF COMPUTER GRAPHICS SYSTEM

Grammar: Articles, Prepositions, Antonyms, Synonyms.

Vocabulary: Basics of Communication (Definition, Types of communication). Importance of body language in corporate culture, Body language (Facial expressions – eye contact – posture – gestures – Proxemics – Haptics – Dress Code – Paralanguage – Tone, pitch, pause & selection of words), Impromptu speeches.

Articles:

Web links: <https://learnenglish.britishcouncil.org/grammar/a1-a2-grammar/articles-1>
<https://www.youtube.com/watch?v=ueEp6U8td1I>

Prepositions:

Web links: <https://www.grammarbook.com/grammar/probPrep.asp>

Antonyms, Synonyms.

Web links: <https://www.youtube.com/watch?v=-mLRoxWM8dI>
<https://www.youtube.com/watch?v=IEOrOPVMxiM>

https://www.it.iitb.ac.in/~vijaya/ssrvn/worksheetscd/getWorksheets.com/Language%20Arts/syn_ant.pdf

Basics of Communication (Definition , Types of communication).

Web links: https://wikieducator.org/INTRODUCTION_TO_COMMUNICATION

Importance of body language in Corporate culture

Web links:

<https://www.forwardfocusinc.com/consciously-communicate/the-importance-of-body-language-in-the-workplace/>

Body language (Facial expressions – eye contact – posture – gestures – Proxemics – Haptics – Dress Code – Paralanguage –Tone, pitch, pause & selection of words)

Web links: <https://open.lib.umn.edu/communication/chapter/4-2-types-of-nonverbal-communication/>
https://en.wikipedia.org/wiki/Nonverbal_communication

Impromptu speeches.

Web links: <https://www.write-out-loud.com/impromptu-public-speaking-topics.html>;
<https://faculty.washington.edu/mcgarrit/COM220/online%20readings/sample%20critique.pdf>

UNIT – II: OUTPUT PRIMITIVES AND ATTRIBUTES

Grammar: Tenses, Idioms and Phrases, One word substitutes.

Vocabulary: Public speaking - *Oral presentations*, writing skills – *Short Essay writing and E- mail writing.*

Tenses

Web links: https://www.englisch-hilfen.de/en/grammar/english_tenses.htmj; <https://onlymyenglish.com/tenses/>;

<https://www.englishpage.com/verbpage/verbtenseintro.html>;
<https://www.englishclub.com/grammar/verb-tenses.htm>

Idioms and Phrases:

Web links: <https://www.britannica.com/list/7-everyday-english-idioms-and-where-they-come-from>
<https://eslexpat.com/english-idioms-and-phrases/>;
<https://onlineteachersuk.com/english-idioms/>;

One word substitutes:

Web links: <https://www.careerpower.in/one-word-substitution.html>;
<https://www.hitbullseye.com/Vocab/One-Word-Substitute-List.php>;
<https://englishan.com/one-word-substitution-set-1/>;

Public speaking - *Oral presentations*

Web links: <https://egyankosh.ac.in/bitstream/123456789/26773/1/Unit-14.pdf>;
<https://www.skillsyouneed.com/rhubarb/preparing-oral-presentations.html>;
<https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12-methods-of-delivery/>

Writing skills – *Short Essay writing and E-mail writing.*

Web links: <https://www.kibin.com/essay-writing-blog/important-essay-writing-skills/>
https://www.scribendi.com/academy/articles/academic_essay_writing_skills.en.html ;
<https://www.microsoft.com/en-us/microsoft-365/business-insights-ideas/resources/improve-email-writing-skills>;

UNIT – III: TWO DIMENSIONAL GRAPHICS TRANSFORMATIONS AND VIEWING

Grammar : Direct and Indirect speeches, Active and Passive voice, Drawing inferences (reading comprehensions and listening comprehensions)

Vocabulary: Leadership Skills – Negotiation skills - Team-building – *Debate*. Leadership Skills – Negotiation skills - Team-building

Direct and Indirect speeches:

Web links: <https://onlymyenglish.com/direct-and-indirect-speech/>
<https://learnenglish.britishcouncil.org/grammar/b1-b2-grammar/reported-speech-1-statements>
<https://www.perfect-english-grammar.com/reported-speech.html>

Active and Passive voice,

Web links: <https://www.englishclub.com/grammar/passive-voice.htm>
<https://www.gingersoftware.com/content/grammar-rules/verbs/passive-voice/>
<https://nps.edu/web/gwc/revising-passive-voice-into-active-voice>

Drawing inferences (reading comprehensions and listening comprehensions)

Web links: <https://www.readingrockets.org/strategies/inference>
<https://www.thoughtco.com/making-inferences-3111201>
<https://www.comprehensionconnection.net/2019/03/exploring-difference-between-making.html>

Vocabulary: Leadership Skills – Negotiation skills - Team-building – *Debate*.

Leadership Skills – Negotiation skills - Team-building

Web links: <https://online.hbs.edu/blog/post/negotiation-skills>
<https://www.bumc.bu.edu/facdev-medicine/files/2014/08/BUSM-Leadership-training.pdf>
<https://in.indeed.com/career-advice/career-development/negotiation-skills>
<https://www.thebalancecareers.com/what-is-team-building-1918270>

Debate:

Web links: <https://noisyclassroom.com/debate-topics/>
<https://www.collegeessay.org/blog/debate-topics>
https://www.edu.gov.mb.ca/k12/cur/socstud/frame_found_sr2/tns/tn-13.pdf

UNIT – IV: THREE DIMENSIONAL GRAPHICS AND VIEWING

Grammar: Common errors, Rearrangement of sentences.

Vocabulary: Resume writing, Pre-interview preparation , Group discussion.

Common errors, Rearrangement of sentences:

Web links:

<https://www.letsstudytogether.co/sentence-arrangement-questions-pdf-for-banking-exams-ibps-sbi-po-and-clerk/>
<https://www.youtube.com/watch?v=e8nO3zZzkZs>

Vocabulary: Resume writing, Pre-interview preparation , Group discussion.

Web links: <https://www.youtube.com/watch?v=PfJg-67smf4>
<https://www.youtube.com/watch?v=-lXjbph22Fk>

UNIT – V: REMOVAL OF HIDDEN SURFACES

Grammar : Verbal ability tests.

Vocabulary: Mock interviews, Post interview Etiquette.

Verbal ability tests.

Web links: <https://prepinsta.com/infosys-english-verbal-questions/>
<https://www.indiabix.com/online-test/verbal-ability-test/random>
<https://www.allindiaexams.in/online-test/online-general-english-test/61>

Vocabulary: Mock interviews, Post interview Etiquette.

Web links: <https://www.youtube.com/watch?v=ZOLCMa2QbdE>
<https://www.ziprecruiter.com/blog/the-right-way-to-follow-up-after-a-job-interview/>
<https://www.youtube.com/watch?v=KloD19uox8>

Textbooks:

1. Robert M Sheffield, “Developing Soft Skills”, Pearson, 2010.

Reference Books:

1. Barun K. Mitra, “Personality Development and Soft Skills”, OXFORD Higher Education 2018.
2. Alka Wadkar, “Life Skills for Success”, Sage publications 2016.
3. Diana Booher, “Communicate with Confidence” Tata mcgraw hill, 1994.
4. B.N. Gosh, “Managing Soft skills for Personality development”, Tata mcgraw hill 2012.
5. Michael Swan, “[Practical English Usage](#)”, Oxford publications.
6. Raymond Murphy, “English Grammar in Use”, Cambridge 5th Edition
7. Norman Lewis, “Word Power Made Easy”, Penguin Publishers.
8. Advanced Grammar in Use A Self-Study Reference and Practice Book for Advanced Learners of English 3rd Edition , Cambridge

Online Learning Resources:

https://www.youtube.com/watch?v=DUIsNJtg2L8&list=PLLy_2iUCG87CQhELCYtvXh0E_y-bOO1_q

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO 6: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice	6.1	6.1.1
CO2	PO 9: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings	9.2	9.2.1
CO3	PO 10: Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1
CO4	PO 9: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings	9.2	9.2.1

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1										2				
CO2										2				
CO3										2		2		
CO4										2				
CO5										2		2		

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI(AUTONOMOUS)

Year: III	Semester: II	Branch of Study: AI & DS			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AHS9902	Professional Ethics and Human values	2	0	0	0

Course Outcomes:

CO1: It ensures students sustained happiness through identifying the essentials of human values and skills.

CO2: The students will understand the importance of Values and Ethics in their personal lives and professional careers.

CO3: The students will learn the rights and responsibilities as an employee, team member and a global citizen.

CO4: Students understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.

CO5: Students can able to develop appropriate technologies and management patterns to create harmony in professional and personal life.

UNIT - 1:

Introduction to Human Values: Need, basic Guidelines, Content and Process for Value Education, Self Exploration – 'Natural Acceptance' and Experiential Validation. Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities. Understanding Happiness and Prosperity correctly.

UNIT - 2:

Understanding Harmony in the Family and Society: Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the harmony in the society (society being an extension of family). Visualizing a universal harmonious order in society - Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family!

UNIT - 3:

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

UNIT - 4:

Professional Practices in Engineering: Work Place Rights & Responsibilities, Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers – The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

UNIT - 5:

Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Depletion, Pollution, Ethics in Manufacturing and Marketing, Media Ethics, War Ethics, Bio Ethics, Intellectual Property Rights.

Text Books:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
3. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

Reference Books:

1. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.
2. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
3. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard Michael J Rabins, 4e ,Cengage learning, 2015.
4. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								2						
CO2								2						
CO3								3						
CO4								2						
CO5								1						

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)