E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

NAGAPATTINAM – 611 002.

(Affiliated to Anna University, Chennai | Accredited by NAAC with 'A++' Grade
Accredited by NBA | Approved by AICTE, New Delhi)

B.TECH – ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
(R–2019)

CURRICULUM FOR THIRD YEAR - FIFTH SEMESTER

B.Tech - AI&DS (R2019) – V Semester									
COURSE CODE	**COURSE NAME**	**CATEGORY**	**L**	**T**	**P**	**C**	**MAX. MARKS**		
							CA	**ES**	**TOTAL**
Theory Courses									
1902AS501	Computer Networks	PC	3	0	0	3	40	60	100
1902AS502	Cloud Computing	PC	3	0	0	3	40	60	100
1902AS503	Internet of Things	PC	3	0	0	3	40	60	100
1902AS504	Advanced Data Management Architectures	PC	3	0	0	3	40	60	100
1902AS505	Machine Learning	PC	3	0	2	4	50	50	100
1903AS002	Professional Elective -I (Robotic Process Automation)	PE	3	0	0	3	40	60	100
Laboratory Courses									
1902AS551	Cloud Computing Lab	PC	0	0	2	1	60	40	100
1902AS552	Programming with Large Datasets Lab	PC	0	0	2	1	60	40	100
Other Courses									
1901MCX03	Essence of Indian Traditional Knowledge	MC	2^	0	0	0	100	-	100
1904GE551	Life Skills: Aptitude I	EEC	0	0	2	1	100	-	100
TOTAL			**18**	**0**	**08**	**22**	**570**	**430**	**1000**

1902AS501	Computer Networks	L	T	P	C
		3	0	0	3

PREREQUISITE:

Nil

COURSE OBJECTIVES:

1.To describe the fundamental concepts of networks from layered perspective
2.To infer the design issues and various data link layer protocols
3.To apply various routing algorithms and network layer protocols in the Internet
4.To gain knowledge about various transport layer protocols and application layer services
5.To analyze security algorithms in networks

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1: Infer basic computer network technology, fundamentals of transmission media and switching technology.
CO2: Identify error detection, correction code mechanisms and data link layer protocols.
CO3: Develop and apply principles and protocols network applications, routing algorithms and internet working.
CO4: Analyse the mechanisms related to transport layer protocols, including UDP and TCP, with a focus on reliable data transfer and congestion control
CO5: Analyse the knowledge in IDS and cryptographic techniques.

COs Vs POs MAPPING:

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

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	1	-
CO2	2	1	-
CO3	3	2	-
CO4	2	2	-
CO5	3	2	-

COURSE CONTENTS:

MODULE I	**INTRODUCTION TO COMPUTER NETWORKS**	**9 Hours**

Introduction: Networks, Network Types, Internet History, Standards and Administration, Network Topologies,
Reference Models: TCP/IP Model, The OSI Model, Internet Architecture and Protocols, Network Applications in AI and Data Science. **Introduction to Physical layer:** Data and Signals, Transmission impairment, Data rate
limits, Performance, **Transmission media:** Introduction, Guided Media, Unguided Media, **Switching:** Introduction, Circuit Switched Networks and Packet switching.

MODULE II	**DATA LINK LAYER**	**9 Hours**

Design Issues - Services, Framing, Error and Flow Control - Error Detection and Correction Codes, Hamming Code, Cyclic Redundancy Check - Data Link Layer Protocols, Simplex Protocol , Sliding Window Protocols - Medium Access Control Sublayer, Multiple Access Protocols, ALOHA, CSMA Protocols, Collision-Free Protocols, Wireless LAN Protocols - Ethernet MAC Protocol, 802.11 MAC Protocol - Data Link Layer Switching, Uses of Bridges, Learning Bridges, Repeaters, Hubs, Bridges, Switches, Routers and Gateways.

MODULE III	**NETWORK LAYER**	**9 Hours**

Design Issues- Routing Algorithms, The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing - Congestion Control Approaches, Traffic-Aware Routing, Admission Control, Internetworking, **The network layer in the Internet:** IPv4 Addresses, IPv6, Internet Control protocol, OSPF, BGP, ICMPv4, IGMP, Subnetting and Network Address Translation (NAT).

MODULE IV	**TRANSPORT AND APPLICATION LAYER**	**9 Hours**

Transport Layer: Services, Elements of Transport Protocols, Congestion Control, Error Control & Flow Control, **The Internet Transport Protocols:** UDP, TCP, TCP Service Model, TCP Congestion Control Algorithm, Port Numbers and Process-to-Process Communication. **Application Layer:** Introduction, Services, Client server model, HTTP, HTTPS, E-mail, WWW, TELNET, FTP, DNS, Server Farms and Web Proxies, Peer-To-Peer Networks, Network Applications for AI and Data Science.

MODULE V	**NETWORK SECURITY**	**9 Hours**

Firewalls, Network Security Threats, Intrusion Detection and Prevention Systems (IDS/IPS), **Introduction to Cryptography:** Substitution Ciphers, Transposition Ciphers, Public Key Algorithms, RSA, Symmetric Algorithm, Cryptography and Network Security Applications in AI/DS, **Introduction to Wireless and Mobile Networks:** Cellular Networks, GSM, LTE, Wireless Local Area Networks and Mobile Network Security**.**

TOTAL: 45 HOURS

FURTHER READING:

1. A.S.Tanenbaum and D.J.Wetherall, "Computer Networks", Pearson, 6th Edition, 2021.
2. Behrouz A. Ferouzon "Data Communication and Networking with TCP/IP Protocol Suite", McGraw Hill, 6th Edition, 2022.

REFERENCES:

1. *William Stallings, "Data & Computer Communication", PHI, 10th Edition 2013.*
2. *Larry L. Peterson and Bruce S. Davie, "Computer Networks- A System Approach", Elsevier, 5th Edition, 2012*
3. *G. Keiser, "Local Area Networks", 2nd Edition, TMH 2002*
4. *D. Bertesekas and R. Gallager, "Data Networks", 2nd Edition, PHI 2000*
5. *Bhavneet Sidhu, "An Integrated Approach to Computer Networks", Khanna Book Publishing House 2019.*
6. *https://onlinecourses.nptel.ac.in/noc22_cs19/preview*
7. *Emergence of Networks & Reference Models: https://nptel.ac.in/courses/106105081*

1902AS502	Cloud Computing	L	T	P	C
		3	0	0	3

PREREQUISITE:

1. 1902AS303 - Database Management Systems
2. 1902AS401 - Operating Systems

COURSE OBJECTIVES:

The major objective of a cloud computing course is to provide students with a comprehensive understanding of the concepts, technologies, and practices associated with cloud computing. This encompasses the architecture, deployment models, service models, virtualization, programming frameworks, infrastructure, and security considerations essential for effectively utilizing and managing cloud environments.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1:	Provides unique design challenges posed by cloud computing environments, such as scalability, elasticity, reliability, availability, and fault tolerance.
CO2:	Designing systems that can handle varying levels of workload by adding or removing resources dynamically.
CO3:	Explore virtualization technology and its various types, including server virtualization, network virtualization, storage virtualization, and desktop virtualization.
CO4:	Gain hands-on experience with virtualization technologies by experimenting with virtual machines (VMs), containers, and Docker.
CO5:	Analyze students how to develop, deploy, and manage services and applications in cloud environments, including setting up a cloud environment using platforms like AWS, Azure, or Google Cloud.

COs Vs POs MAPPING:

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

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	1	-
CO2	2	1	-
CO3	2	1	-
CO4	2	1	-
CO5	2	1	-

COURSE CONTENTS:

MODULE I	**CLOUD ARCHITECTURE MODELS AND INFRASTRUCTURE**	**9 Hours**

Cloud Architecture: System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – Cloud deployment models – Cloud service models; Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Design Challenges.

MODULE II	**VIRTUALIZATION BASICS**	**9 Hours**

Virtual Machine Basics – Taxonomy of Virtual Machines – Hypervisor – Key Concepts –Virtualization structure – Implementation levels of virtualization – Virtualization Types: Full Virtualization – Para Virtualization – Hardware Virtualization – Virtualization of CPU, Memory and I/O devices.

MODULE III	**VIRTUALIZATION INFRASTRUCTURE AND DOCKER**	**9 Hours**

Desktop Virtualization – Network Virtualization – Storage Virtualization – System-level of Operating Virtualization – Application Virtualization – Virtual clusters and Resource Management – Containers vs. Virtual Machines – Introduction to Docker – Docker Components – Docker Container – Docker Images and Repositories.

MODULE IV	**CLOUD DEPLOYMENT ENVIRONMENT**	**9 Hours**

Google App Engine – Amazon AWS – Microsoft Azure; Cloud Software Environments – Eucalyptus– OpenStack .

MODULE V	**CLOUD SECURITY**	**9 Hours**

Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyperjacking. Data Security and Storage; Identity and Access Management (IAM) - IAM Challenges - IAM Architecture and Practice.

TOTAL: 45 HOURS

FURTHER READING:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. James Turnbull, "The Docker Book", O'Reilly Publishers, 2014.

REFERENCES:

1. *RajkumarBuyya, James Broberg, and Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, 1st Edition, 2011.*
2. *Ray J. Rafaels, Cloud Computing: From Beginning to End, 1st Edition, 2016*
3. *James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.*
4. *Tim Mather, SubraKumaraswamy, and ShahedLatif, "Cloud Security and Privacy: An enterprise perspective on risks and compliance", O'Reilly Media, Inc., 2009.*
5. *https://nptel.ac.in/courses/106105167.*
6. *https://nptel.ac.in/courses/106105223.*
7. *https://nptel.ac.in/courses/106104182*

1902AS503	Internet of Things	L	T	P	C
		3	0	0	3

PREREQUISITE: Nil

COURSE OBJECTIVES:

	1. Understanding core technology, application, sensors used and IoT architecture along with the industry perspective
	2.Introduce students to learn various principles and operations of different types of sensors commonly used on mobile platform
	3.Enhance students' ability to design and implement real time solutions using IOT

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1:	Gain extensive IoT knowledge and abilities to excel in the fast-evolving IoT industry.
CO2:	Successfully set up and configure Raspberry Pi with the required operating system and peripherals.
CO3:	Evaluate and select the most suitable wireless communication technology for a given IoT application.
CO4:	Apply various IoT technologies in real-life applications.
CO5:	Acquire knowledge about various types of sensors used in IoT applications

COs Vs POs MAPPING:

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

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	2	-
CO2	2	2	-
CO3	3	2	-
CO4	3	2	-
CO5	3	2	-

COURSE CONTENTS:

MODULE I	**INTRODUCTION TO IOT**	**9 Hours**

What is IoT, how does it work, Difference between Embedded device andIoT device, Properties of IoT device, IoT Ecosystem, IoT Decision Framework, IoT SolutionArchitecture Models, Major IoT Boards in Market.

MODULE II	**SETTING UP RASPBERRY/ARDUINO TO CREATE SOLUTIONS**	**9 Hours**

Explore Raspberry Pi, setting up RaspberryPi, showing working of Raspberry Pi using SSH Client and Team Viewer, Understand Sensingactions, Understand Actuators and MEMS.

MODULE III	**COMMUNICATION PROTOCOLS USED IN IOT**	**9 Hours**

Types of wireless communication, Major wireless Shortrange communication devices, properties, comparison of these devices (Bluetooth, WIFI, ZigBee,6LoWPAN), Major wireless Long-range communication devices, properties, comparison of thesedevices (Cellular IoT, LPWAN).

MODULE IV	**IOT APPLICATIONS AND CASE STUDIES**	**9 Hours**

Industrial Internet 4.0, Applications such as: Smart home, wearables, smart city,smart grid, connected car, connected health (digital health, telehealth, telemedicine), smart retail. Case Studies : Activity Monitoring

MODULE V	**SENSORS**	**9 Hours**

Applications of various sensors: Google Maps, Waze, WhatsApp, Ola Positioningsensors: encoders and accelerometers, Image sensors: cameras, Global positioning sensors: GPS,GLONASS, IRNSS, Galileo and indoor localization systems, Motion & Orientation Sensors:Accelerometer, Magnetometer, Proximity Sensor, Gyroscope Calibration, noise modeling andcharacterization and noise filtering and sensor data processing. Privacy &Security

TOTAL: 45 HOURS

REFERENCES:

1. *Jeeva Jose, "Internet of Things", Khanna Book Publishing Company, 2021.*
2. *CunoPfister, Getting Started with the Internet of Things, O Reilly Media, 2011*
3. *Kyung, C.-M., Yasuura, H., Liu, Y., Lin, Y.-L., Smart Sensors and Systems, SpringerInternational Publishing, 2015*
4. *ArshdeepBahga, Vijay Madisetti, "Internet of Things – A Hands-on Approach", Universities Press, 2015.*
5. *Simon Monk, "Programming the Raspberry Pi: Getting Started with Python", McGrawHill, 2013*
6. *Samuel Greengard, "The Internet of Things", 1st Edition, MIT Press, 2015.*
7. *Peter Waher, "Mastering Internet of Things: Design and create your own IOT applications using Raspberry Pi 3", 1st Edition, Packt Publishing Ltd, 2018.*
8. *https://onlinecourses.nptel.ac.in/noc24_cs115/preview*
9. *https://youtu.be/b-fCl-UDJuo?si=IVkp8GsvAxunfSO_*
10. *https://youtu.be/WUYAjxnwjU4?si=IxeF2WzBtudz5A8i*

1902AS504	Advanced Data Management Architectures	L	T	P	C
		3	0	0	3

PREREQUISITE:

1. 1902AS303 - Database Management Systems
2. 1902AS305 - Big Data Systems

COURSE OBJECTIVES:

1. Introduce the importance of big data and role of Hadoop framework in analyzing large datasets
2. Familiarize writing queries in Pig and Hive to process big data
3. Present latest big data frameworks and applications using Spark and Scala.
4. Discuss the concept and writing applications using SparkSQL
5. Provide the concepts of NoSQL databases and study the working mechanisms of MongoDB.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1:	Describe Hadoop Distributed File System and apply MapReduce architecture to solve real world problems.
CO2:	Build scripts using Pig over large datasets and query using Hive.
CO3:	Develop Apache Spark's architecture, APIs, toolset, machine learning, and advanced analytics.
CO4:	Apply Resilient Distributed Datasets (RDD) for creating applications in Spark and query using SparkSQL.
CO5:	Analyze NoSQL databases and develop data models using MongoDB.

COs Vs POs MAPPING:

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

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	1	-
CO2	3	1	-
CO3	3	1	-
CO4	3	2	-
CO5	3	2	-

COURSE CONTENTS:

MODULE I	BIG DATA CONCEPTS	9 Hours

Big Data, Importance of Big Data, Big Data use cases. **The Hadoop Distributed Files system:** The Design of HDFS, HDFS Concepts, HDFS Federation, HDFS High Availability, Basic File system Operations, Hadoop File systems, Anatomy of a File Read, Anatomy of a File Write. **Map Reduce:** What is Map reduce, Architecture of map reduce **How Map Reduce Works:** Anatomy of a Map Reduce Job Run, Failures in Map Reduce. **Map Reduce Types and Formats:** Map Reduce Types, The Default Map Reduce Job, Input Formats, Input Splits and Records, Text Input, Output Formats, Text Output, Developing a Map Reduce Application.

MODULE II	PIG AND HIVE	9 Hours

Pig: Installing and Running Pig, Generating Examples, Comparison with Databases, Pig Latin, UserDefined Functions, Data Processing Operators, Pig in Practice. **Hive:** Installing Hive, The Hive Shell, An Example, Running Hive, Comparison with Traditional Databases, Hive QL, Tables, Querying Data, User-Defined Functions, Writing a User Defined Functions, Writing a User Defined Aggregate Function .

MODULE III	INTRODUCTION TO SPARK	9 Hours

Introduction to Spark: What is Apache Spark, History of Spark, Present and Future of Spark, Running Spark, Spark's Basic Architecture, Spark Applications, Spark's Language APIs, Spark's APIs, Starting Spark, The Spark Session Data Frames, Partitions, Transformations, Lazy Evaluation, Actions, Spark UI, An End-to-End Example, Data Frames and SQL. **Spark's Toolset:** Running Production Applications, Datasets: Type-Safe Structured APIs, Structured Streaming, Machine Learning and Advanced Analytics, Lower-Level APIs, Spark R, Spark's Ecosystem and Packages.

MODULE IV	SPARK SQL AND RDD	9 Hours

Spark SQL: SQL, Big Data and SQL: Apache Hive, Spark SQL, Spark's Relationship to Hive, How to Run Spark SQL Queries, Catalog, Tables, Views, Databases, Select Statements, **Datasets:** When to Use Datasets, Creating Datasets, Actions, Transformations **Resilient Distributed Datasets:** Introduction to RDDs, Creating RDDs, Manipulating RDDs, Transformations, Actions, Saving Files, Caching, Check pointing, Pipe RDDs to System Commands .

MODULE V	NO SQL DATABASES	9 Hours

No SQL Databases: Review of traditional Databases, Need for NoSQL Databases, Columnar Databases, Failover and reliability principles, CAP Theorem, Differences between SQL and NoSQL databases, **Working mechanisms of Mongo DB:** Overview, Advantages, Environment, Data Modelling, Create Database, Drop Database, Create collection, Drop collection, Data types, Insert, Query, Update and Delete operations, Limiting and Sorting records, Indexing, Aggregation.

TOTAL: 45 HOURS

REFERENCES:

1. *Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.*
2. *V.K. Jain, Data Science and Analytics (with Python, R and SPSS Programming), Khanna Book Publis Company.*
3. *V.K. Jain, Big Data and Hadoop, Khanna Book Publishing Company 2020.*
4. *Thilinagunarathne, Hadoop MapReduce v2 Cookbook – 2 nd Edition, Packet Publishing, 2015.*
5. *Chuck Lam, Mark Davis, Ajit Gaddam, "Hadoop in Action", Manning Publications Company, 2016.*
6. *Alex Holmes," Hadoop in Practice", Manning Publications Company, 2012.*
7. *Alan Gates, "Programming Pig", O'Reilly Media Inc, 2011.*
8. *Edward Capriolo, Dean Wampler, and Jason Rutherglen, "Programming Hive", O'Reilly Media Inc, Octo 2012.*
9. *http://www.planetcassandra.org/what-is-nosql*
10. *http://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html*
11. *https://class.coursera.org/datasci-001/lecture*
12. *http://bigdatauniversity.com*
13. *https://onlinecourses.nptel.ac.in/noc20_cs92/preview*

1902AS505	Machine Learning	L	T	P	C
		3	0	2	4

PREREQUISITE:

Nil

COURSE OBJECTIVES:

	To understand pattern classification algorithms to classify multivariate data
	To understand the implementation of genetic algorithms
	To gain knowledge about Q-Learning
	To create new machine learning techniques.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1:	Recognize the characteristics of Machine Learning techniques that enable to solve real world problems
CO2:	Apply supervised and unsupervised algorithms, probabilistic and evolutionary approaches for the given problems
CO3:	Design neural network to solve classification and function approximation problems
CO4:	Analyze optimal classifiers using genetic algorithms
CO5:	Perform Evaluation of Machine Learning algorithms and Model Selection.

COs Vs POs MAPPING:

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

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	2	2	-
CO2	3	2	-
CO3	3	2	-
CO4	3	3 3	-
CO5	3	3 3	-

COURSE CONTENTS:		
MODULE-I	**BASICS OF MACHINE LEARNING**	**9 Hours**
Learning Problems Perspectives and Issues -Concept Learning Task -Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm –Hypothesis Space Search.		
MODULE-II	**SUPERVISED AND UNSUPERVISED LEARNING**	**9 Hours**
Supervised learning: **Regression models:** Simple Linear Regression, multiple linear Regression. Cost Function, Gradient Descent, Performance Metrics. **Classification models:** Decision Trees-ID3, CART, K-Nearest-Neighbours (KNN), Multinomial Logistic Regression - Nonlinearity and Kernel Methods. **Unsupervised learning**: K-means, Instance Based Learning: Gaussian mixture models and Expectation maximization.		
MODULE-III	**NEURAL NETWORKS**	**9 Hours**
Perceptron - activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, ReLU, hyperparameter tuning, batch normalization, regularization, dropout.		
MODULE-IV	**GENETIC ALGORITHMS**	**9 Hours**
Representing Hypotheses, Genetic Operator, Fitness Function and Selection, Hypothesis Space Search, Genetic Programming, **Models of Evolution and Learning:**Lamarkian Evolution, Baldwin Effect, Parallelizing Genetic Algorithms.		
MODULE-V	**ADVANCED LEARNING**	**9 Hours**
Learning Sets of Rules -Sequential Covering Algorithm -Learning Rule Set -First Order Rules Sets of First Order Rules- Induction on Inverted Deduction -Inverting Resolution-Analytical Learning with Perfect Domain Theories -Explanation Base Learning – FOCL Algorithm -Reinforcement Learning Task Learning Temporal Difference Learning.		
		TOTAL: 45 HOURS
LIST OF EXPERIMENTS:		
1.Implement ML models using SVM		
2.Implement ML models using KNN		
3.Implement ML models using K-Means		
4.Implement ML models using Logistic Regression		
5.Implement ML models using Linear Regression		
6.Implementation of Bayesian networks		
7.Extract the data from database using Python/R/Matlab		
8.Implement Naïve Bayes theorem to classify the English text		
9.Implement an algorithm to demonstrate the significance of genetic algorithm		
10.Implement the finite words classification system using Backpropagation algorithm		
		TOTAL: 15 HOURS

REFERENCES:

1. *EthemAlpaydin, (2004) "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press*
2. *T. astie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer(2nded.), 2009*
3. *https://www.udacity.com/course/intro-to-machine-learning--ud120*
4. *https://www.coursera.org/learn/machine-learning-duke*
5. *https://onlinecourses.nptel.ac.in/noc23_cs18/preview*
6. *https://onlinecourses.nptel.ac.in/noc20_cs49/preview*

1903AS002	Robotic Process Automation	L	T	P	C
		3	0	0	3

PREREQUISITE:

Nil

COURSE OBJECTIVES:

This syllabus is designed to provide a comprehensive learning path for developers who want to build and deploy robotic process automation (RPA) solutions using UiPath Studio.

It covers the essential topics required for both the Automation Developer Associate and Automation Developer Professional certifications.

The syllabus is divided into five units, each focusing on a specific area of UiPath Studio development.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1:	Develop Foundational RPA Solutions to automate interactions
CO2:	Perform complex data manipulation to enhance RPA Solutions with Advanced Data Management
CO3:	Build Robust and Maintainable Automations exploring advanced RPA functionalities
CO4:	Manage and Deploy RPA Projects with Orchestrator in automation implementation methodologies
CO5:	Develop Advanced RPA Solutions with Specialized Techniques for automation development

COs Vs POs MAPPING:

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

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	1	-
CO3	2	1	-
CO4	3	2	-
CO5	3	2	-

COURSE CONTENTS:

MODULE I	**RPA FUNDAMENTALS**	**09 Hours**

Introduction to Robotic Process Automation (RPA), Explore automation development with UiPath Studio, Build your first process with Studio, Variables, Constants and Arguments in Studio, Control Flow in Studio, Excel Automation with the Modern Experience in Studio, User Interface (UI) Automation with Modern Design in Studio

MODULE II	**DATA MANIPULATION AND UIPATH STUDIO**	**09 Hours**

Data Manipulation with Strings in Studio, Data Manipulation with Lists and Dictionaries in Studio, UI Automation Synchronization with Studio, UI Automation Descriptors in Studio, Selectors in Studio Deep Dive, Data Manipulation with Data Tables in Studio

MODULE III	**ADVANCED STUDIO FUNCTIONALITIES**	**09 Hours**

Debugging in Studio, Error and Exception Handling in Studio, Working with Local Files and Folders in Studio, Email Automation With Studio, PDF Automation with Studio, Introduction to Logging in Studio

MODULE IV	**ORCHESTRATOR AND PROJECT MANAGEMENT**	**09 Hours**

Orchestrator Overview for Automation Developers, Working with Orchestrator Resources, Object Repository in Studio, UiPath Integration Service Overview, Version Control Systems Integration in Studio, Workflow Analyzer in Studio, RPA Testing with Studio, Project Organization in Studio, Automation Implementation Methodology Fundamentals

MODULE V	**ADVANCED AUTOMATION DEVELOPMENT**	**09 Hours**

State Machines in Studio, Introduction to Robotic Enterprise Framework, Building a REFramework Project with Orchestrator Queues, Building a REFramework Project with Tabular Data, Practice with REFramework, Orchestrator Triggers and Monitoring, Advanced Data Manipulation with Studio, UI Automation with Studio, AI Computer Vision with Studio, Remote Debugging with Studio, Invoke Method and Invoke Code in Studio

TOTAL: 45 HOURS

REFERENCES:

1. *"Ui Path Studio X Robotic Process Automation: A Beginner's Guide" by Adir Moshe*
2. *"Robotic Process Automation with Ui Path Studio: Design, Build, and Deploy Automated Solutions"*
3. *Learning Ui Path Robotic Process Automation - Building Software Robots for Business Automation by adir Sharon*
4. *Ui Path Studio X Robotics Process Automation: A Beginner's Guide to Building Software Robots by Mohammed Al-Buraiki*
5. *RPA Implementation: A Guide to Successful Robotic Process Automation by Bernd Hinz*
6. *UiPath Advanced Development with Computer Vision and Machine Learning by Ramya Devi Vaddi*
7. *https://www.uipath.com/rpa/academy*

1902AS551	Cloud Computing Lab	L	T	P	C
		0	0	2	1

PREREQUISITE:

1. 1902AS303 - Database Management Systems
2. 1902AS401 - Operating Systems

COURSE OBJECTIVES:

The major objective of a cloud computing course is to provide students with a comprehensive understanding of the concepts, technologies, and practices associated with cloud computing. This encompasses the architecture, deployment models, service models, virtualization, programming frameworks, infrastructure, and security considerations essential for effectively utilizing and managing cloud environments. To determine the characteristics of power electronic devices.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1:	Acquire virtualization and private cloud setup skills
CO2:	Manage and configure virtual machines
CO3:	Acquire practical skills in software installation and usage
CO4:	Implement and utilize storage solutions
CO5:	Acquire skills related to advanced virtual machine management

COs Vs POs MAPPING:

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

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	2	2	-
CO2	3	2	-
CO3	2	2	-
CO4	3	3	-
CO5	2	3	-

LIST OF EXPERIMENTS:

1. Installation of VMware Workstation to setup a private cloud
2. Create virtual machine of different configurations. Check how many virtual machines can be utilized at particular time
3. Installation of operating systems in virtual machines
4. Attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine
5. Install a C compiler in the virtual machine and execute a sample program
6. Install a storage controller and interact with it.
7. Creation of snapshot of virtual machine
8. Restoring the state of virtual machine from snapshot
9. Installation and configuration of VMware ESXI server
10. Migration of virtual machine from one node to another.

TOTAL: 30 HOURS

REFERENCES:

1. *RajkumarBuyya, James Broberg, and Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, 1st Edition, 2011.*
2. *Ray J. Rafaels, Cloud Computing: From Beginning to End, 1st Edition, 2016.James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems andProcesses", Elsevier/Morgan Kaufmann, 2005.*
3. *Tim Mather, SubraKumaraswamy, and ShahedLatif, "Cloud Security and Privacy: anenterprise perspective on risks and compliance", O'Reilly Media, Inc., 2009.*
4. *https://nptel.ac.in/courses/106105167.*
5. *https://nptel.ac.in/courses/106105223.*
6. *https://nptel.ac.in/courses/106104182.*

1902AS552	PROGRAMMING WITH LARGE DATASETS LAB	L	T	P	C
		0	0	2	1

PREREQUISITE:

1. 1902AS303 - Database Management Systems
2. 1902AS305 - Big Data Systems

COURSE OBJECTIVES:

The objective of this course is to provide hands-on training in writingprograms to analyze, model and visualize large datasets. In particular, the students willlearn programming using Map-reduce, Python, R etc. to solve. Students will learn how tosolve common data analysis problems using datasets from a variety of domains: websearch, e-commerce, social-networking, machine learning etc. To determine the characteristics of power electronic devices.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1:	Interpret the results of statistical computations to gain insights into the dataset.
CO2:	Illustrate, visualize box-plots and histograms for numerical variables in large multivariatedatasets, and compute correlation metrics
CO3:	Apply MapReduceprograms to perform clustering and classification of a large multi-variate dataset
CO4:	Build spark programs to compute box-plots and histograms of all the numerical variables in a largedataset.
CO5:	Analyze a spark program to perform classification and regression in a large dataset.

COs Vs POs MAPPING:

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

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	2	-
CO2	3	2	-
CO3	3	2	-
CO4	3	3	-
CO5	3	3	-

LIST OF EXPERIMENTS:

1. Write a map reduce program to compute descriptive statistics such as mean, median, mode, standard deviation from a large dataset.
2. Write a map-reduce program to compute box-plots and histograms of all the numerical variables in a large multi-variate dataset.
3. Write a map-reduce program to compute correlation metrics between pairs of all the numerical variables in a large multi-variate dataset.
4. Write a map-reduce program to perform clustering of a large multi-variate dataset. Measure the runtime and study its scaling behaviour as more nodes are added to the cluster.
5. Write a map-reduce program to perform classification of a large multi-variate dataset into two or more classes.
6. Write a spark program to compute box-plots and histograms of all the numerical variables in a large dataset.
7. Write a spark program to perform classification in a large dataset. Measure the runtime and study its scaling behaviour as more nodes are added to the cluster.
8. Write a spark program to perform regression in a large dataset. Measure the runtime and study its scaling behaviour as more nodes are added to the cluster.

TOTAL: 30 HOURS

REFERENCES:

1. *P. J. Sadalage, M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World ofPolyglot Persistence", Addison-Wesley Professional, 2012.*
2. *Tom White, "Hadoop: The Definitive Guide", 3/e, O'Reilly, 2012 .*

1901MCX03	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	L	T	P	C
		2	0	0	0

PREREQUISITE:

NIL

COURSE OBJECTIVES:

1.To get a knowledge in Indian Culture
2.To Know Indian Languages and Literature and the fine arts in India
3.To explore the Science and Scientists of Medieval and Modern India

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1:	Acquire a thorough grasp of what culture, civilization, and heritage entail, along with their defining features.
CO2:	Develop a deep understanding of India's literary and linguistic diversity, leading to a greater appreciation of its cultural heritage.
CO3:	Enhance cultural awareness and respect for India's rich spiritual heritage.
CO4:	Acquire detailed insights into India's diverse contributions to art, architecture, and science across various historical periods.
CO5:	Explore how education in India has developed and changed from ancient times to the present.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	2	-	-	2	2	2	1	2	-	1
CO2	1	-	-	-	-	2	2	2	-	1	-	1
CO3	1	-	-	-	-	2	2	2	-	-	-	2
CO4	1	-	-	-	-	1	1	1	-	-	-	-
CO5	2	-	-	-	-	2	2	2	-	1	-	2

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	-	-	-
CO2	1	-	-
CO3	1	-	-
CO4	2	-	-
CO5	2	-	-

COURSE CONTENTS:		
MODULE I	**INTRODUCTION TO CULTURE**	**6 Hours**
Culture, civilization, Culture and heritage, General characteristics of culture, Importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India.		
MODULE II	**INDIAN LANGUAGES,CULTURE AND LITERATURE**	**6 Hours**
Indian Languages and Literature-I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India Indian Languages and Literature-II: Northern Indian languages & literature		
MODULE III	**RELIGION AND PHILOSOPHY**	**6 Hours**
Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)		
MODULE IV	**FINE ARTS IN INDIA (ART,TECHNOLOGY&ENGINEERING)**	**6 Hours**
Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern),Science and Technology in India, development of Science in ancient, medieval and modern India		
MODULE V	**EDUCATION SYSTEM IN INDIA**	**6 Hours**
Education in ancient ,medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India.		
		TOTAL: 30 HOURS
REFERENCES:		
1. Kapil Kapoor, –Text andInterpretation: The IndiaTradition‖,ISBN:81246033375, 2005		
2.ScienceinSamskrit‖,SamskritaBhartiPublisher,ISBN13:978-8187276333,2007		
3.NCERT,—PositionpaperonArts,Music,DanceandTheatre‖,ISBN81-7450494-X,200		
4.S.Narain,—ExaminationsinancientIndia‖,AryaBookDepot,1993		
5.SatyaPrakash,—FoundersofSciencesinAncientIndia‖,VijayKumarPublisher,1989		
6.M.Hiriyanna,—EssentialsofIndianPhilosophy‖,MotilalBanarsidassPublishers,ISBN13:978-8120810990, 2014		