Hindi Vidya Prachar Samiti's

Ramniranjan Jhunjhunwala College of Arts, Science & Commerce, Ghatkopar(W)

(Empowered Autonomous College)

Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for M.Sc. IT Part II

Program: M.Sc. in Information Technology

Program Code: RJSPGIT

National Education Policy (NEP 2020)

Level 6.5

(CBCS 2024-25)

Credit Structure for MSc IT Semester III and IV as per NEP 2020
(To be implemented from Academic Year 2024-25)
Semester III

Papers	Number of papers	Credits	Total Credits
Major Mandatory Theory	3	4	12
Major Mandatory Practical	3	2	6
Major Elective Theory	1 - Elective I or Elective II	2	2
Major Elective Practical	1 - Elective I or Elective II	2	2
Total Credits			**22**

Semester IV

Papers	Number of papers	Credits	Total Credits
Major Mandatory Theory	1	4	4
Major Mandatory Practical	2	2	4
Major Elective Theory	1 - Elective I or Elective II	2	2
Major Elective	1 - Elective I or Elective II	2	2
Research Project	1	10	10
Total Credits			**22**

Syllabus Grid

Year	Level	Semester	Major		Minor	OE	VSC SEC	AEC, VEC, IKS	OJT, FP, CEP, CC, RP	Cum. Credit Per Sem	Degree / Cum.Cr.
			Mandatory	Elective							
II	6.5	III	Cloud Solution Architecture (4+2) Machine Learning (4+2) Robotic Process Automation (4+2)	Malware Analysis (2+2) Deep Learning (2+2)						22	44
		IV	Emerging Technologies (4+2) Advanced IoT Practical (2)	Cyber Forensics (2+2) Natural Language Processing(2+2)					RP(10)	22	
		Cum. Credits	26	8					10	44	

Semester III

Course Code	Course Name	Credits	Duration
RJSPIT301	Major Mandatory Course: Cloud Solution Architecture	4	60 Hours

Learning Objectives:

1. Learning how to make architectural decisions based on AWS architectural principles and best practices.
2. To study AWS architecture, services and relational management database systems in AWS.
3. To explore practices for data security, management.

Course Outcomes	Description: (After successful completion of this course, student will be able __)	Bloom's Levels	PSO Addressed
CO1	To Understand and Describe the various concepts of Cloud Computing, AWS Fundamentals like AmazonS3, EC2,EBS,AWS Cloud Computing Platform like CloudWatch and Auto Scaling.	1,2,3	PSO1, PSO1
CO2	To Understand and Describe Amazon Elasticache, Additional Key Services, the SQS, SWF, and SNS,Domain Name System (DNS), Amazon Route 53, Security on AWS,AWS Risk and Compliance.	1, 2,3	PSO1, PSO2
CO3	To Understand, Apply and Analyze the Amazon Virtual Private Cloud (Amazon VPC), AWS Identity and Access Management (IAM), AWS Databases.	1,2,3,4	PSO1, PSO2, PSO3
CO4	To explore and apply domain knowledge of AWS	1,2	PSO1, PSO4

Unit	Details	Hours
I	**Introduction to AWS** What Is Cloud Computing, AWS Fundamentals, AWS Cloud Computing Platform. **Amazon Simple Storage Service (Amazon S3) and Amazon Glacier Storage** Object Storage versus Traditional Block and File Storage, Amazon Simple Storage Service (Amazon S3) Basics, Buckets, Amazon S3 Advanced Features, Amazon Glacier. **Amazon Elastic Compute Cloud (Amazon EC2) and Amazon Elastic Block Store (Amazon EBS)**	15

	Amazon Elastic Compute Cloud (Amazon EC2), Amazon Elastic Block Store (Amazon EBS). **Elastic Load Balancing, Amazon CloudWatch, and Auto Scaling** Elastic Load Balancing, Amazon CloudWatch, Auto Scaling.	
II	**Amazon Virtual Private Cloud (Amazon VPC)** Amazon Virtual Private Cloud (Amazon VPC), Subnets, Route Tables, Internet Gateways, Dynamic Host Configuration Protocol (DHCP) Option Sets, Elastic IP Addresses (EIPs), Elastic Network Interfaces (ENIs), Endpoints, Peering, Security Groups, Network Access Control Lists (ACLs), Network Address Translation (NAT) Instances and NAT Gateways, Virtual Private Gateways (VPGs), Customer Gateways (CGWs), and Virtual Private Networks (VPNs). **AWS Identity and Access Management (IAM)** Principals, Authentication, Authorization, Other Key Features. **Databases and AWS** Database Primer, Amazon Relational Database Service (Amazon RDS), Amazon Redshift, Amazon DynamoDB.	**15**
III	**SQS, SWF, and SNS** Amazon Simple Queue Service (Amazon SQS), Amazon Simple Workflow Service (Amazon SWF), Amazon Simple Notification Service (Amazon SNS). **Domain Name System (DNS) and Amazon Route 53** Domain Name System (DNS), Amazon Route 53 Overview. **Amazon ElastiCache** In-Memory Caching, Amazon ElastiCache. **Additional Key Services** Storage and Content Delivery, Security, Analytics, DevOps.	**15**
IV	**Security on AWS** Shared Responsibility Model, AWS Compliance Program, AWS Global Infrastructure Security, AWS Account Security Features, AWS Cloud Service-Specific Security. **AWS Risk and Compliance** Overview of Compliance in AWS, Evaluating and Integrating AWS Controls, AWS Risk and Compliance Program, AWS Reports, Certifications, and Third-Party Attestations. **Architecture Best Practices** Design for Failure and Nothing Fails, Implement Elasticity, Leverage Different Storage Options, Build Security in Every Layer, Think Parallel, Loose Coupling Sets You Free, Don't Fear Constraints.	**15**

References:

1. Joe Baron (Author), Hisham Baz (Author), Tim Bixler (Author), Biff Gaut (Author), Kevin E. Kelly (Author), "AWS Certified Solutions Architect Official Study Guide: Associate Exam (Aws Certified Solutions Architect Official: Associate Exam)",1st Edition .

2. Marcus Young, "Implementing Cloud Design Pattern for AWS", PACKT Publication.
3. Bernard Golden, "Amazon Web Services For Dummies".

Course Code	Course Name	Credits	Duration
RJSPIT301P	Major Mandatory Course: Cloud Solution Architecture Practical	2	30 Hours

Learning Objectives:

1. To introduce AWS environment, configuration, routing, peering, creating cloud and managing cloud.
2. To set up a web server in EC2, to host a static website on S3, accessible over the internet and to set up and configure a web application to create an S3 bucket, upload a file and read its contents.
3. To work on Amazon DynamoDB, and Redshift.
4. To introduce and implement AWS lambda and Amazon API gateway.

Course Outcomes	Description: (After successful completion of this course, student will be able __)	Bloom's Levels	PSO Addressed
CO1	To Understand and Apply AWS environment, configuration, routing, peering, creating cloud and managing cloud,AWS IAM User, Working with S3 Buckets.	1,2,3	PSO1, PSO2
CO2	To Understand and Apply S3: Multi-Region Storage Backup with Cross-Region Replication, Amazon DynamoDB.	1,2,3	PSO1, PSO2
CO3	To Understand and Apply Amazon Redshift, AWS Key management Service.	1,2,3	PSO1, PSO2, PSO3
CO4	To Understand and Apply AWS Lambda,Amazon API Gateway,Amazon Architecture with the help of case studies.	1,2,3	PSO1 PSO4

Practical No.	Details
1.	Introduction: Getting Familiarized with AWS Console. a. Creating Aws Free Tier Account b. Getting Familiarised With The Aws Console
2.	An Aws Iam User : Creating an AWS IAM User.

	a. Explore users and groups b. Add users to groups c. Sign-In and test the users
3.	Working With S3 Buckets. a. Create a bucket b. Upload an object to the bucket c. Make an object public d. Create a bucket policy e. Explore versioning
4.	S3:Multi-Region Storage Backup with Cross-Region Replication. a. Create and configure source and destination buckets b. Enable cross region-replication on bucket c. Configure replication of a single folder d. Configure replication using tags e. Deleting replicated files
5.	Introduction to Amazon DynamoDB. a. Create a new table b. Add data c. Modify existing items d. Query the table e. Delete the table
6.	Introduction to Amazon Redshift. a. Launch an amazon redshift cluster b. Launch Pgweb to communicate with the redshift cluster c. Create a table d. Load sample data from amazon S3 e. Query data
7.	Introduction to AWS Key management Service. a. Create KMS master key b. Configure cloudTrail to store Logs in an S3 Bucket c. Upload an Image to S3 bucket and encrypt it d. Access the encrypted image e. Monitor KMS activity Using CloudTrail Logs f. Manage encryption keys
8.	Introduction to AWS Lambda Overview Scenario. a. Create the Amazon S3 Buckets b. Create an AWS Lambda Function c. Test Your Function d. Monitoring and Logging e. Conclusion
9.	Introduction to Amazon API Gateway.

	a. Overview b. Technical Concepts c. Create a Lambda Function d. Test the Lambda function e. Conclusion
10.	Case Study: Amazon Architecture. a. ABP News b. Buzz dial c. Classle

Course Code	Course Name	Credits	Duration
RJSPIT302	**Major Mandatory Course: Machine Learning**	**4**	**60 Hours**

Learning Objectives:

1. Learning machine learning models and applying it to real world applications.
2. Understand and train the machine learning models.
3. Analyze and evaluate the results of machine learning models.

Course Outcomes	Description: (After successful completion of this course, student will be able __)	Bloom's Levels	PSO Addressed
CO1	To understand and explore the concepts of Machine Learning.	1,2,3	PSO1
CO2	To understand and implement the statistical and programming approach of various machine learning algorithms.	1,2,3,4	PSO1, PSO2
CO3	To analyze and evaluate the results of various statistical models/algorithms.	1,2,3,4, 5	PSO3
CO4	To enable the student to solve real world problems that are aligned with artificial intelligence and machine learning.	1,2,3,4, 5,6	PSO4

Unit	Details	Hours

I	**Machine Learning Basics** Introduction to Machine Learning, Key Terminology of Machine Learning, Key Tasks of Machine Learning, Selection of Machine Learning algorithm, Development of Machine Learning Application, Applications of Machine Learning, Machine learning Models: Geometric Models, Logical Models, Probabilistic Models, **Feature Selection and Feature Engineering** Creating Dataset, Creating Training, Testing and Validation Dataset, Managing Categorical data, Managing Missing Features, Data Scaling and Normalization.Dimensionality Reduction using Feature Extraction, Dimensionality. **Model Evaluation** Introduction, Cross-Validating Models, Creating a Baseline Regression Model, Creating a Baseline Classification Model, Evaluating Binary Classifier Predictions, Evaluating Binary Classifier Thresholds, Evaluating Multiclass Classifier Predictions, Visualizing a Classifier's Performance, Evaluating Regression Model, Evaluating Clustering Model.	**15**
II	**Linear Regression** Introduction, Fitting a Line, Handling Interactive Effects, Fitting a Nonlinear Relationship, Reducing Variance with Regularization, Reducing Features with Lasso Regression. **Trees and Forests** Introduction, Training a Decision Tree Classifier, Training a Decision Tree Regressor, Visualizing a Decision Tree Model, Training a Random Forest Classifier, Training a Random Forest Regressor, Identifying Important Features in Random Forests, Selecting Important Features in Random Forests, Handling Imbalanced Classes, Controlling Tree Size, Improving Performance Through Boosting, Evaluating Random Forests with Out-of-Bag Errors.	**15**
III	**K-Nearest Neighbors** Introduction, Finding an Observation's Nearest Neighbors, Creating a K-Nearest Neighbor Classifier, Identifying the Best Neighborhood Size, Creating a Radius-Based Nearest Neighbor Classifier. **Logistic Regression** Introduction, Training a Binary Classifier, Training a Multiclass Classifier, Reducing Variance Through Regularization, Training a Classifier on Very Large Data, Handling Imbalanced Classes. **Support Vector Machines** Introduction, Training a Linear Classifier, Handling Linearly Inseparable Classes Using Kernels, Created Predicted Probabilities, Identifying Support Vectors, Handling Imbalanced Classes.	**15**
IV	**Naive Bayes** Introduction, Training a Classifier for Continuous Features, Training a	**15**

	Classifier for Discrete and Count Features, Training a Naive Bayes Classifier for Binary Features, Calibrating a Predicted Probabilities. **Clustering** Introduction, Clustering Using K-Means, Speeding Up K-Means Clustering, Clustering Using Meanshift, Clustering Using DBSCAN, Clustering Using Hierarchical Merging, Affinity propagation. **Association rule learning** Association rule mining algorithms: Apriori algorithm, FP-Growth algorithm, Eclat algorithm.	

References:

1. Giuseppe Bonaccorso, "Machine Learning Algorithms: Reference Guide for Popular Algorithms for Data Science and Machine Learning", PACKT Publication,2017.
2. Cheris Albon, "Machine Learning with Python Cookbook: Practical Solutions from Preprocessing to Deep Learning", O'Reilly, SPD, First Edition, 2018.
3. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", Cambridge University Press, 2012.
4. Hastie, Tibshirani, Friedman, "Introduction to Statistical Machine Learning with Applications in R", Springer, 2nd Edition, 2012.
5. Ethem Alpaydin, "Introduction to Machine Learning", PHI, 2nd Edition, 2023.

Course Code	Course Name	Credits	Duration
RJSPIT302P	**Major Mandatory Course: Machine Learning Practical**	**2**	**30 Hours**

Learning Objectives:

1. Defining the problem statement and selecting the machine learning models to solve real world problems.
2. Collecting and preparing the data to train the machine learning models.
3. Training machine learning models and evaluating the results.
4. Analyze the results of machine learning models.

Course Outcomes	Description: (After successful completion of this course, student will be able to __)	Bloom's Levels	PSO Addressed
CO1	To define the problem statement and select the machine learning models to solve real world problems.	1,2,3,4,5,6	PSO1
CO2	To Collect and prepare the data to train the machine learning models using various techniques.	1,2,3	PSO1, PSO2, PSO3
CO3	Train the machine learning models and evaluate the results using different methods.	1,2,3,4,5	PSO3

CO4	Analyze the results of machine learning models and decide the optimum model from the selected alternative models for the specific application.	1,2,3,4,5,6	PSO4

Practical No.	Details
1.	a. Identifying the business problem and defining the problem statement. b. Identifying models and features, processing data and building a model. c. Evaluating models and creating reports.
2.	a. Building and evaluating the regression models: Simple linear regression, Multiple linear recession and polynomial regression. b. 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.
3.	a. Implement the different Distance methods (Euclidean) with Prediction, Test Score and Confusion Matrix. b. Perform Data Loading, Feature selection (Principal Component analysis) and Feature Scoring and Ranking.
4.	a. Write a program to implement Decision Tree and Random forest with Prediction, Test Score and Confusion Matrix. b. For a given set of training data examples stored in a .CSV file implement Least Square Regression algorithm.
5.	a. For a given set of training data examples stored in a .CSV file implement Linear Regression Algorithms. b. For a given set of training data examples stored in a .CSV file implement Random Forest Classifier Algorithm.
6.	a. For a given set of training data examples stored in a .CSV file implement K-nearest Neighbour Algorithm. b. For a given set of training data examples stored in a .CSV file implement Logistic Regression algorithm.
7.	a. For a given set of training data examples stored in a .CSV file implement Support Vector Machine algorithm. b. Implement the classification model using clustering for the following techniques with hierarchical clustering with Prediction, Test Score and Confusion Matrix.
8.	a. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task.
9.	a. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using

	the standard Heart Disease Data Set.
10.	a. Implement the classification model using clustering for the following techniques with K means clustering with Prediction, Test Score and Confusion Matrix. b. Implementation and evaluation of centroid-based and density based clustering algorithms.

Course Code	Course Name	Credits	Duration
RJSPIT303	**Major Mandatory Course: Robotic Process Automation**	**4**	**60 Hours**

Learning Objectives:

- To make the students aware about automation today in the industry.
- To make the students aware about the tools used for automation.
- To help the students automate a complete process

Course Outcomes	Description: (After successful completion of this course, student will be able __)	Bloom's Levels	PSO Addressed
CO1	To Describe and Understand the mechanism of the business process to provide the solution in an optimized way using UiPath Studio.	1,2	PSO1
CO2	To Understand and Implement the features used for interacting with plugins and automating processes.	1,2, 3	PSO2
CO3	To Understand, Use and Handle the different events, debugging and managing the errors.	1, 2, 3, 4	PSO3
CO4	To Create, Test and Deploy the automated process using UiPath studio and orchestrator.	1,2,3,4, 5,6	PSO4

Unit	Details	Hours
I	**Robotic Process Automation** Scope and techniques of automation, About UiPath, Record and Play UiPath stack, Downloading and installing UiPath Studio, Learning UiPath Studio, Task recorder, Step-by-step examples using the recorder. **Sequence, Flowchart, and Control Flow** Sequencing the workflow Activities, Control flow, various types of loops, and decision making, Step-by-step example using Sequence and Flowchart, Step-by-step example using Sequence and Control flow.	**15**

II	**Data Manipulation** Variables and scope, Collections, Arguments - Purpose and use, Data table usage with examples, Clipboard management, File operation with step-by-step example, CSV/Excel to data table and vice versa (with a step-by-step example **Taking Control of the Controls** Finding and attaching windows, Finding the control, Techniques for waiting for a control, Act on controls – mouse and keyboard activities, Working with UiExplorer, Handling events, Revisit recorder, Screen Scraping, When to use OCR, Types of OCR available, How to use OCR, Avoiding typical failure points.	**15**
III	**Tame that Application with Plugins and Extensions** Terminal plugin, SAP automation, Java plugin, Citrix automation, Mail plugin, PDF plugin, Web integration, Excel and Word plugins, Credential management, Extensions – Java, Chrome, Firefox, and Silverlight **Handling User Events and Assistant Bots** What are assistant bots? Monitoring system event triggers, Hotkey trigger, Mouse trigger, System trigger, Monitoring image and element triggers, an example of monitoring email, Example of monitoring a copying event and blocking it, Launching an assistant bot on a keyboard event.	**15**
IV	**Exception Handling, Debugging, and Logging** Exception handling, Common exceptions and ways to handle them, Logging and taking screenshots, debugging techniques, Collecting crash dumps, Error reporting. **Managing and Maintaining the Code** Project organization, Nesting workflows, Reusability of workflows, commenting techniques, State Machine, when to use Flowcharts, State Machines, or Sequences, using config files and examples of a config file, Integrating a TFS server. **Deploying and Maintaining the Bot** Publishing using publish utility, Overview of Orchestration Server, Using Orchestration Server to control bots, Using Orchestration Server to deploy bots, License management, Publishing and managing updates.	**15**

References:

1. Learning Robotic Process Automation, Alok Mani Tripathi, Packt, 1st Edition, 2018.
2. Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation, Srikanth Merianda, Createspace Independent Publishing, 1st Edition, 2018.
3. The Simple Implementation Guide to Robotic Process Automation (RPA): How to Best Implement RPA in an Organization, Kelly Wibbenmeyer, iUniverse, 1st Edition, 2018.

Course Code	Course Name	Credits	Duration

RJSPIT303P	Major Mandatory Course: Robotic Process Automation Practical	2	30 Hours

Learning Objectives:
The student will be able to:
1. Create automated processes using UiPath Studio.
2. Implement and deploy automation events using UiPath Orchestrator.

Course Outcomes	Description: (After successful completion of this course, student will be able __)	Bloom's Levels	PSO Addressed
CO1	To Understand the mechanism of the business process and can provide the solution in an optimized way.	1, 2	PSO1
CO2	To Implement recording features in the project and Apply plugins UiPath.	1, 2, 3	PSO2
CO3	To Use and handle the different events, debugging and managing the errors..	1,2,3,4	PSO3
CO4	To Test and Deploy the Automated Process.	1,2,3,4,5,6	PSO4

Practical No.	Details
1.	a. Create a simple sequence based project. b. Create a flowchart-based project. c. Create an UiPath Robot which can empty a folder in Gmail solely on the basis of recording.
2.	a. Automate UiPath Number Calculation (Subtraction, Multiplication, Division of numbers). b. Create an automation UiPath project using different types of variables (number, datetime, Boolean, generic, array, data table).
3.	a. Create an automation UiPath Project using decision statements. b. Create an automation UiPath Project using looping statements.
4.	a. Automate any process using basic recording. b. Automate any process using desktop recording. c. Automate any process using web recording.
5.	a. Consider an array of names. We have to find out how many of them start with the letter "a". b. Create an automation where the number of names starting with "a" is counted and the result is displayed.

6.	a. Create an application automating read, write and append operation on excel files. b. Automate the process to extract data from an excel file into a datatable and vice versa.
7.	a. Implement the attach window activity. b. Find different controls using UiPath. c. Demonstrate the following activities in UiPath: i. Mouse (click, double click and hover) ii. Type into iii. Type Secure text
8.	a. Demonstrate the following events in UiPath: i. Element triggering event ii. Image triggering event iii. System Triggering Event b. Automate the following screen scraping methods using UiPath. i. Full Test ii. Native iii. OCR c. Install and automate any process using UiPath with the following plug-ins: i. Java Plugin ii. Mail Plugin iii. PDF Plugin iv. Excel Plugin v. Word Plugin vi. Credential Management
9.	a. Automate the process of sending mail events (on any email). b. Automate the process of launching an assistant bot on a keyboard event. c. Demonstrate the Exception handling in UiPath.
10.	a. Automate the process of logging and taking screenshots in UiPath. b. Automate any process using the State Machine in UiPath. c. Create a workflow and publish it to the UiPath Orchestrator.

Course Code	Course Name	Credits	Duration
RJSPITE301	**Major Elective Course: Malware Analysis**	**2**	**30 Hours**

Learning Objectives:

1. To Develop skills necessary to carry out independent analysis of modern malware samples using both static and dynamic analysis techniques.
2. To Apply techniques and concepts to unpack, extract, decrypt, or bypass new anti-analysis techniques in future malware samples.
3. To Extract investigative leads from host and network-based indicators associated with a malicious program.
4. To Achieve proficiency with industry standard tools including IDA Pro, OllyDbg,

WinDBG, PE Explorer, ProcMon etc.

Course Outcomes	Description: (After successful completion of this course, student will be able__)	Bloom's Levels	PSO Addressed
CO1	To Understand various introductory techniques of malware analysis and creating the testing environment.	1,2,3	**PSO1**
CO2	To Perform advanced dynamic, static analysis and recognize constructs in assembly code.	1,2,3	**PSO2**
CO3	To Perform Reverse Engineering using OLLYDBG and WINDBG and study the behaviors and functions of malware.	1,2,3,4, 5	**PSO3**
CO4	To Understand and Apply data encoding, various malware techniques for Shellcode Analysis.	1,2,3,4, 5,6	**PSO4**

Unit	Details	Hours
I	**BASIC ANALYSIS** Basic Static Techniques, Malware Analysis in Virtual Machines, Basic Dynamic Analysis.	**7**
II	**ADVANCED STATIC ANALYSIS** IDA Pro Analyzing Malicious Windows Programs, Debugging.	**7**
III	**ADVANCED DYNAMIC ANALYSIS** OllyDbg, Kernel Debugging with WinDbg, Malware Behavior.	**8**
IV	**MALWARE FUNCTIONALITY** Data Encoding, Covert Malware Launching, Shellcode Analysis.	**8**

References:

1. Practical Malware Analysis by Michael Sikorski and Andrew Honig, 2012.
2. Mastering Malware Analysis by Alexey Kleymenov and Amr Thabet, Packt Publishing,2019
3. Windows Malware Analysis Essentials by Victor Marak, Packt Publishing, 2015.

Course Code	Course Name	Credits	Duration
RJSPITE301P	**Major Elective Course: Malware Analysis Practical**	**2**	**30 Hours**

Learning Objectives:

1. To Identify different types of malware by operation and effective mitigation strategies.
2. To Perform reverse engineering to determine the function of malicious code in a

binary.
3. To Determine malicious communication protocols from network communication.
4. To Understand and utilize intrusion and anomaly detection techniques.
5. To Detects and eradicates malicious software from a system.

Course Outcomes	Description: (After successful completion of this course, student will be able __)	Bloom's Levels	PSO Addressed
CO1	To understand and Analyze various malicious file types.	1,2,3, 4	PSO1, PSO3
CO2	To Build and Utilize a sandbox environment for malware analysis.	1,2,3,4,5, 6	PSO2
CO3	To Apply various tools to identify the vulnerabilities and to perform Malware analysis.	1,2,3	PSO3
CO4	To Apply malware classification and functionality & anti-reverse engineering techniques.	1,2,3	PSO4

Practical No.	Details
1.	Introduction to malware, analysis, and trends. Infection vectors and discovery.
2.	Use the tool and technique: VirusTotal to gain information about the files: Analyze suspicious files, domains, IPs and URLs to detect malware and other breaches, automatically share them with the security community using VirusTotal .
3.	Introduction to IDA Pro: Analyze the malware found in the file using IDA Pro.
4.	Analyze the malware found in the file using basic dynamic analysis tools.
5.	Analyze the malware found in the file that continues running and achieves persistence when the computer is restarted.
6.	Analyze the malware found in the file using OllyDbg and IDA Pro using basic static and dynamic analysis techniques.
7.	Analyze the implementation of both a driver and an executable.
8.	Demonstrate malware functionalities using tools and techniques.
9.	Analyze the malware found in the file using a debugger. The goal of this lab is to figure out the correct password. The malware does not drop a malicious payload.

10.	Analyze the file using shellcode_launcher.exe.

Course Code	Course Name	Credits	Duration
RJSPITE302	Major Elective Course: Deep Learning	2	30 Hours

Learning Objectives:

1. To learn the concepts required to build the neural network.
2. To Understand and design the neural networks for real life applications.
3. To optimize the neural network.

Course Outcomes	Description: (After successful completion of this course, student will be able to __)	Bloom's Levels	PSO Addressed
CO1	To Understand and remember the Mathematical, Statistical and Computational Concepts and techniques that are required to build the various types of Neural Networks.	1,2,3	PSO1
CO2	To prepare the dataset and design the different models of Neural Networks for various AI applications.	1,2,3	PSO2
CO3	To evaluate, analyze and optimize the different models of Neural Networks.	1,2,3,4, 5	PSO3
CO4	To explore and apply the various models in Artificial Intelligence applications.	1,2,3,4, 5,6	PSO4

Unit	Details	Hours
I	**Applied Mathematics and Machine Learning Basics** **Linear Algebra:** Scalars, Vectors, Matrices and Tensors, Multiplying Matrices and Vectors , Identity and Inverse Matrices, Linear Dependence and Span , norms, special matrices and vectors, eigen decompositions. **Numerical Computation:** Overflow and underflow, poor conditioning, Gradient Based Optimization, Constraint optimization**.**	7
II	**Deep Networks** Deep feedforward network, regularization for deep learning , Optimization for Training deep models.	7
III	**Convolutional Neural Networks** Convolutional Layer, Pooling Layer, Normalisation Layer, Fully-Connected Layer, CovNet.	8

	Recurrent Neural Networks: RNN, Backpropagation through time, Long Short-Term Memory, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs.	
IV	**Deep Learning Research** Linear Factor Models, Autoencoders, representation learning, Deep Generative Models.	**8**

References:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courvile, "Deep Learning : An MIT Press Book", First Edition, 2016.
2. Nikhil Buduma with contributions by Nicholas Locascio, "Fundamentals of Deep Learning,"O'Reilly, 2017.
3. Douwe Osinga, "Deep Learning CookBook", O'Reilly, First Edition, 2017.

Course Code	Course Name	Credits	Duration
RJSPITE302P	**Major Elective Course: Deep Learning Practical**	**2**	**30 Hours**

Learning Objectives:

1. To create and build various neural networks for real world applications.
2. To design and implement the various neural networks using the deep learning framework.

Course Outcomes	Description: (After successful completion of this course, student will be able to __)	Bloom's Levels	PSO Addressed
CO1	Describes basics of mathematical foundation that will help the learner to understand the concepts of Deep Learning.	1,2,3	PSO1
CO2	Design and implement various deep learning architectures for various data like text & image data.	1,2,3	PSO2
CO3	Apply various deep learning techniques to design, Analyze and Evaluate the efficient algorithms for real-world applications.	1,2,3,4,5,6	PSO3
CO4	To create a small Artificial Intelligence application using a deep learning Model.	1,2,3,4,5,6	PSO4

Practical No.	Details
1.	Introduction to Deep Learning frameworks.

2.	Implementing Mathematical and Computational concepts using the Deep Learning Frameworks.
3.	Implementing Single and Multilayer Perceptron.
4.	Implementation of Feed Forward Neural Network.
5.	Implementation of Backpropagation Neural Network.
6.	Implementation of Convolutional Neural Network.
7.	Implementation of Recurrent Neural Network.
8.	Implementation of Long Short Term Memory Neural Network.
9.	Implementation of Autoencoder.
10.	Implementation of Deep Generative Model.

Evaluation and Assessment

Evaluation (Theory):

1. Total marks for each Major-Mandatory theory course:100 Marks.

a. CLA: 40 Marks.
Assignment/Presentation/Seminar/written test/problem solving/paper review/Project.

b. Semester End Examination: 60 Marks.

2. Total marks for each Major-Elective theory course: 50 Marks.

3. Total marks for each Major-Mandatory Practical and Major-Elective Practical course: 50 Marks.

Course Semester End Examination in Semester III Major - Mandatory Papers: RJSPIT301, RJSPIT302 and RJSPIT303.

Questions	Knowledge & Understanding	Create/ Application and Analyze	Total Marks per Unit
Unit I	6	6	12
Unit II	6	6	12
Unit III	6	6	12
Unit IV	6	6	12
Questions from Topics covering All 4 Units	6	6	12
Total Marks per Objective	30	30	60
% Weightage	50%	50%	100%

Course Semester End Examination in Semester III Major - Elective Papers: RJSPITE301, RJSPITE302.

Questions	Knowledge & Understanding	Create/ Application and Analyze	Total Marks per Unit
Unit I	3	3	6
Unit II	3	3	6

Unit III	**3**	**3**	**6**
Unit IV	**3**	**3**	**6**
Questions from Topics covering All 4 Units	**3**	**3**	**6**
Total Marks per Objective	**6**	**6**	**30**
% Weightage	**50%**	**50%**	**100%**

Course Semester End Examination in Semester III Major Mandatory and Major Elective Practical Papers: RJSPIT301P, RJSPIT302P, RJSPIT303P, RJSPITE301P and RJSPITE302P.

1. Continuous Evaluation of components which require adequate duration for completion of the task and submission: 50%.

Course end Practical Evaluation of skills of students in terms of skill, analysis, Interpretation, and conclusion: 50%.

Semester IV

Course Code	Course Name	Credits	Duration
RJSPIT401	Emerging Technologies	4	60 Hours

Learning Objectives:

1. To orient the students on advanced technologies like Node.js, React.js and DevOps.
2. To understand the design and deployment of functional web applications.
3. To enable learners to create applications using React.js.

Course Outcomes	Description: (After successful completion of this course, student will be able to __)	Bloom's Levels	PSO Addressed
CO1	To Understand and Remember the concepts of Javascript, Node.js, React, Devops, Jenkin etc.	1,2	PSO1
CO2	To Implement a functional web application development using React.	1,2,3	PSO2
CO3	To Use DevOps tool to integrate web services.	1,2,3,4	PSO3
CO4	To deploy web applications using Containers.	1,2,3,4, 5,6	PSO4

Unit	Details	Hours
I	**Javascript Overview** Data Type and Data Structures, Operators, Objects and Object properties, Arrays, Functions, Classes, Modules, Closures. **Node.js** Node.js Modules, Node.js file system, Node.js URL Module, Node.js NPM, Node.js Events, Node.js Upload files, Node.js MongoDB.	15
II	**Introduction to React** Architecture, Creating a React Application, JSX, Components and Props, State and Lifecycle, Life cycle methods for handling different phases of components. **React Management** Event Management, Conditional Rendering, Lists and Keys, Hooks: UseState, UseEffect, UseContext. **React Programming** HTTP client programming, Form Programming, Thinking in React.	15
III	**Advanced React** Routing, Redux, React Testing and Deployment-Testing,CLI commands,	15

	building and deployment, Context API. **Advanced Technologies** Introduction to DevOps, Git - Version Control System, Github: Remote repository, Jenkins: Using Jenkin, Pipeline, Managing Jenkin, Securing Jenkin, System Administration, calling Jenkin.	
IV	**Advanced Tools and Systems** Maven**:** Features, Naming Conventions, Build Lifecycle, The POM, Profile, Standard Directory Layout, Dependency Mechanism, Introduction to Maven Plugins, Docker: Containerize an application, Update application, Share application, Persist todo data, Use bind mounts, Kubernetes: Container Orchestration.	**15**

References:

1. Chris Minnick, "Beginning ReactJS Foundations Building User Interfaces with ReactJS", Wrox, 1st Edition, 2022.
2. Kirupa Chinnathambi, "Learning React: A Hands-On Guide to Building Web Applications Using React and Redux", Addison-Wesley, 2nd Edition, 2018.
3.

Course Code	Course Name	Credits	Duration
RJSPIT401P	**Emerging Technologies Practical**	**2**	**30 Hours**

Learning Objectives:

1. To use the advanced technologies like Node.js, React.js and DevOps etc. for creating an application.
2. To share, implement and deploy an application on containers.

Course Outcomes	Description: (After successful completion of this course, student will be able to __)	Bloom's Levels	PSO Addressed
CO1	Understand and Apply the advanced technologies like Node.js, React.js and DevOps etc. for creating an application.	1,2	PSO1
CO2	Implement a functional web application development using React.	1,2,3	PSO2
CO3	Use DevOps tool to integrate web services.	1,2,3,4	PSO3
CO4	Deploy web applications using Containers.	1,2,3,4,5,6	PSO4

Practical No.	Details

1.	Using Javascript Data Type and Data Structures, Operators, Objects and Object properties.
2.	Using Javascript Arrays, Functions, Classes, Modules, Closures.
3.	Implementing Node.js Modules, Events and Objects.
4.	Creating an application using Node.js and MongoDB.
5.	Using Functional Components and Functions in React to create an application.
6.	Using Conditional Rendering in React to create an application.
7.	Creating context API in React.
8.	Styling in React with CSS classes.
9.	Using Parent/Child Components in React to create an application.
10.	Demonstration of creating and handling applications using Jenkin / Maven / Docker.

Course Code	**Course Name**	**Credits**	**Duration**
RJSPIT402P	**Advanced Internet of Things Practical**	**2**	**30 Hours**

Learning Objectives:

1. To understand the latest developments in IoT.
2. To design and implement interconnection and integration of sensors to development boards.
3. To design and implement applications of IoT using various sensors.
4. To build our down IoT platform.

Course Outcomes	**Description: (After successful completion of this course, student will be able to __)**	**Bloom's Levels**	**PSO Addressed**
CO1	Identify and Define the Industrial Internet of Things.	1,2,3	PSO1
CO2	Design the Prototype and give solutions for the real world problems.	1,2,3,4,5,6	PSO3
CO3	Develop smart applications with the help of smart devices.	1,2,3,4,5,6	PSO3
CO4	Demonstrate the implementation of IoT based applications in the cloud.	1,2,3,4	PSO2, PSO4

Practical No.	Details
1.	Loading Raspbian / Buster OS on Raspberry Pi (installation).
2.	Build your own IoT platform. Face Detection using IoT devices. (Pi Camera or using any relevant sensors)
3.	Building the Internet of things enabled a real time water quality monitoring system.
4.	Write an application using Raspberry Pi/Arduino for traffic signal monitoring and control systems.
5.	Implement a smart home automation system. The system automates home appliances and controls them over the internet from anywhere.
6.	Interfacing Temperature and Humidity sensor with Cloud and Sending Tweet if temperature and Humidity are beyond set range.
7.	Working with IoT cloud platforms - IBM Watson, Google IoT, AWS IoT etc.
8.	Working with IoT cloud platforms - IBM Watson, Google IoT, AWS IoT etc .
9.	Voice Control of Devices using Blynk, IFTTT and Webhooks.
10.	Create blockchain on Raspberry Pi and implement and test it.

Course Code	Course Name	Credits	Duration
RJSPITE401	**Cyber Forensics**	**02**	**30 Hours**

Learning Objectives:

1. To Understand laws relevant to computer forensics.
2. To Seize and recover digital evidence from pc systems.
3. To Analyze data and reconstruct events and Perform Forensic Analysis of a Virtual Machine.
4. To Understand Cloud Forensics and Analyze Cloud Applications.

Course Outcomes	Description: (After successful completion of this course, student will be able __)	Bloom's Levels	PSO Addressed
CO1	To Understand the procedure of investigation and acquiring the data from various devices.	1,2,6	PSO1
CO2	To Understand, perform and describe the network, virtual machine, cloud, dropbox and Google drive	1,2,3,4, 5,6	PSO3

	analysis and to create the investigation report.		
CO3	To Recover data from the device using forensic tools.	1,3	PSO1, PSO4
CO4	To Investigate internet frauds done through various gadgets like mobile, laptops, tablets and become a forensic investigator.	3,5,6	PSO2

Unit	Details	Hours
I	**Computer Forensics** The present Scenario, The Investigation Process, Computers - Searching and Seizing, Electronic Evidence, Procedures to be followed by the first responder. **Setting up a lab for Computer Forensics** Hard Disks and File Systems, Forensics on Windows Machine, Acquire and Duplicate Data. **Recover Data** Recovery of deleted files and partitions, Using Access Data FTK and Encase for forensics Investigation, Forensic analysis of Steganography and Image files, Cracking Application passwords.	7
II	**Network Forensics** Capturing logs and correlating to the events, Network Forensics – Investigating logs and Network traffic, Investigating Wireless and Web Attacks. Email Tracking and Email Crime investigation. Mobile Forensics, Reports of Investigation, Become an expert witness. **Virtual Machine Forensics** Types of Hypervisors, Hypervisor Files and Formats, Use and Implementation of Virtual Machines in Forensic Analysis, Use of VMware to establish working version of suspect's machine, Networking and virtual networks within Virtual Machine, Forensic Analysis of a Virtual Machine (Imaging of a VM, Identification and Extraction of supporting VM files in the host system, VM Snapshots, Mounting Image, Searching for evidence).	7
III	**Cloud Forensics** Introduction to Cloud Computing, Challenges faced by Law enforcement and government agencies, Cloud Storage Forensic Framework (Evidence Source Identification and preservation, Collection of Evidence, Examination and analysis of collected data) Cloud Storage Forensic Analysis.	8
IV	**Dropbox analysis**	8

	Data remnants on user machines, Evidence source identification and analysis, Collection of evidence from cloud storage services, Examination and analysis of collected data. **Google Drive** Forensic analysis of Cloud storage and data remnants, Evidence source identification and analysis - Collection of evidence from cloud storage services, Examination and analysis of collected data, Issues in cloud forensics.	

References:

1. The official CHFI Exam 312-49 study Guide, Dave Kleiman, SYNGRESS, 2007.
2. Virtualization and Forensics A Digital Forensic Investigator's Guide to Virtual Environments by Diane Barrett
3. Cloud Forensics by Keyun Ruan, Joe Carthy, Tahar Kechadi, Mark Crosbie
4. EC-Council CHFIv10 Study Guide, EC-Council, 2018.
5. Digital Forensics and Incident Response, Gerard Johansen, Packt Publishing, 2020.
6. Guide to Computer Forensics and Investigations, Bill Nelson, Amelia Phillips, Christopher
7. Stuarts, Course Technology, Cengage Learning, 4th edition, 2010.

Course Code	Course Name	Credits	Duration
RJSPITE401P	**Cyber Forensics Practical**	**2**	**30 Hours**

Learning Objectives:

1. To Understand Windows Forensics.
2. To Perform File System Analysis.
3. To Describe Cryptography, Encryption and Decryption.

Course Outcomes	Description: (After successful completion of this course, student will be able__)	Bloom's Levels	PSO Addressed
CO1	To Explore various computer forensic tools for performing the forensic investigation.	1,2,3	PSO1
CO2	To Collect, recover and analyze the data using forensics tools.	1,2,3,4	PSO1
CO3	To Encryption and decryption of data files using the various algorithms.	1,2,3,4,5	PSO2
CO4	To Analyze and validate digital evidence data and creation of investigation reports.	1,2,3,4,5	PSO2

Practical	Details

No.	
1.	File System Analysis using The SleuthKit (Autopsy, fsstat, istat, fls and img_stat).
2.	a. Explore Windows forensic tools (OS Forensics). b. Forensics Investigation Using Encase. c. Using Mobile Forensics software tools. d. Exploring Mobiledit Forensics.
3.	Using Forensic Toolkit (FTK) Writing report using FTK (AccessData FTK).
4.	a. Using File Recovery Tools [FTK Imager] Creating Image. b. Recover Deleted files using Recuva, PC Inspector File Recovery, Recover My Files, R Studio.
5.	a. Using Web attack detection tools [Wireshark]. b. Using Log & Traffic Capturing & Analysis Tools [Wireshark]. c. Using Network Forensic Analysis Tool (NetworkMiner). d. Using Network Traffic Analyser tool Iris.
6.	Using Data Acquisition Tools [ProDiscover Pro].
7.	a. Using Steganography Tools [S-Tools]. b. Using Whitespace Steganography tool SNOW.
8.	a. Performing Password Cracking [Cain & Abel]. b. Performing Sniffing [Cain & Abel].
9.	Investigating Employee Misconduct using Magnet AXIOM.
10.	Investigating a Suspected Mobile Device Theft using Cellebrite UFED.

Course Code	Course Name	Credits	Duration
RJSPITE402	**Natural Language Processing**	**2**	**30 Hours**

Learning Objectives:

1. To learn sentence structure.
2. To learn Morphological analysis, Lexical analysis, Syntactic and Semantic analysis.
3. To learn feature engineering concepts and rule-based systems for NLP.

Course Outcomes	Description: (After successful completion of this course, student will be able to __)	Bloom's Levels	PSO Addressed
CO1	Understand and Use the basics, techniques and algorithms of NLP.	1,2,3	PSO1

C02	Understand the structure of a sentence and perform the various types of analysis.	1,2,3,4	PSO1, PSO2
C03	Understand and Perform the various types of text analysis.	1,2,3,4, 5	PSO1, PSO2, PSO3
CO4	Using various techniques and algorithms to solve real world problems.	1,2,3,4, 5,6	PSO1, PSO2, PSO3, PSO4

Unit	Details	Hours
I	**Introduction** Understanding natural language processing, Understanding basic applications, Advantages of togetherness, NLP and Python, Environment setup for NLTK. **Practical Understanding of a Corpus and Dataset** What is a corpus? Why do we need a corpus? Understanding corpus analysis, understanding types of data attributes, exploring different file formats for corpora, Resources for accessing free corpora, Preparing a dataset for NLP applications, Web scraping.	7
II	**Understanding the Structure of a Sentences** Understanding components of NLP, Natural language understanding, Defining context-free grammar, Morphological analysis, Syntactic analysis, Semantic analysis, Handling ambiguity, Discourse integration, Pragmatic analysis, word-sense disambiguation. Compositional semantics.	7
III	**Pre-processing** Handling corpus-raw text, Handling corpus-raw sentences, Basic pre-processing, Practical and customized pre-processing. **Feature Engineering and NLP Algorithms** Understanding feature engineering, Basic feature of NLP, Basic statistical features for NLP, Advantages of features engineering, Challenges of features engineering.	8
IV	**NLP Applications** Information Extraction, Introduction to Named Entity Recognition and Relation Extraction, Question Answering Text Summarization, Dialog System : Machine Translation.	8

References:

1. "Python Natural Language Processing", Jalaj Thanaki, Packt.
2. "Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit", By Steven Bird, Ewan Klein, and Edward Loper, NLTK.

3. "Speech and Language Processing", Daniel Jurafskey and James H. Martin, Prentice Hall, 2009.
4. "Foundation of Statistical Natural Language Processing", Christopher D. Manning and Heinrich Schütze, MIT Press, 1999.

Course Code	Course Name	Credits	Duration
RJSPITE402P	Natural Language Processing Practical	2	30 Hours

Learning Objectives:
The students will be able to:
1. The students will learn natural language processing concepts, Lexical processing, syntactic processing, semantic processing and modeling.

Course Outcomes	Description: (After successful completion of this course, student will be able to __)	Bloom's Levels	PSO Addressed
CO1	Understand and Use the basics of NLP. Understand and Perform Lexical Analysis. Using various algorithms/ methods for Lexical processing.	1,2,3	PSO1
CO2	Understand the Part-Of-Speech tagging and Rule-Based system. Creating the Parser tree for the given text. Perform the text processing using the information extraction techniques.	1,2,3,4	PSO1, PSO2, PSO3
CO3	Understand and Perform the Semantic processing. Understand and Use the various databases and algorithms for semantic processing.	1,2,3,4	PSO1, PSO2, PSO3
CO4	Understand and Use the various techniques and algorithms for Topic modeling. Understand the various components of NLP. Understand the various case studies of NLP. Build and evaluate small applications of NLP.	1,2,3,4	PSO1, PSO2, PSO3, PSO4

Practical No.	Details
1.	Text Tokenization a. Tokenization using Python's split() function. b. Tokenization using Regular Expressions (RegEx). c. Tokenization using NLTK / Tokenization using the spaCy library. d. Tokenization using Keras/ Tokenization using Gensim.

2.	a. Study of various Corpus – Brown, Inaugural, Reuters etc. with various methods like fields, raw, words, sents, categories etc. b. Create and use your own corpora(plaintext, categorical). c. Study Conditional frequency distributions
3.	a. Study of tagged corpora with methods like tagged_sents, tagged_words. b. Write a program to find the most frequent noun tags. c. Map Words to Properties Using Python Dictionaries.
4.	a. Study of Wordnet Dictionary with methods as synsets, definitions, examples, antonyms. b. Study lemmas, hyponyms, hypernyms, entailments,
5.	a. Write a program using python to find synonym and antonym of word "active" using Wordnet b. Compare two nouns
6.	a. Handling stopwords. b. Using nltk Adding or Removing Stop Words in NLTK's Default Stop Word List Using Gensim Adding and Removing Stop Words in Default Gensim Stop Words List. c. Using Spacy Adding and Removing Stop Words in Default Spacy Stop Words List
7.	Important NLP Libraries for Indian Languages and perform: a. Word tokenization in Hindi. b. Generate similar sentences from a given Hindi text input. c. Identify the Indian language of a text.
8.	Illustrate part of speech tagging. a. Part of speech Tagging and chunking of user defined text. b. Named Entity recognition of user defined text. c. Named Entity recognition with diagram using NLTK corpus – treebank.
9.	**Case Study:** Question Answering/Text Summarization.
10.	**Case Study:** Dialog System/Machine Translation

Course Code	Course Name	Credits	Duration
RJSPITRP403	**Research Project**	**10**	**150 Hours**

Learning Objectives:
The students will be able to:
1. Understand data collection through survey, field research, questionnaire design, content analysis, analysis of existing data, etc.
2. Implement data analysis and interpretation of results.

3. Write the project report.

Course Outcomes	Description: (After successful completion of this course, student will be able to __)	Bloom's Levels	PSO Addressed
CO1	Implement substantial research-based project	1,2,3	PSO1
CO2	Analyze data and synthesize research findings	1,2,3,4	PSO1, PSO2, PSO3
CO3	Report research findings in written and verbal forms	1,2,3,4	PSO1, PSO2, PSO3
CO4	Use research findings to advance education theory and practice	1,2,3,4	PSO1, PSO2, PSO3, PSO4

Evaluation and Assessment

Evaluation (Theory):

4. Total marks for each Major-Mandatory theory course:100 Marks.
    a. CLA: 40 Marks.
    Assignment/Presentation/Seminar/written test/problem solving/paper review/Project.
    b. Semester End Examination: 60 Marks.
5. Total marks for each Major-Elective theory course: 50 Marks.
6. Total marks for each Major-Mandatory Practical and Major-Elective Practical course: 50 Marks.

Course Semester End Examination in Semester IV Major - Mandatory Papers: RJSPIT401

Questions	Knowledge & Understanding	Create/ Application and Analyze	Total Marks per Unit
Unit I	6	6	12
Unit II	6	6	12
Unit III	6	6	12
Unit IV	6	6	12
Questions from Topics covering All 4 Units	6	6	12
Total Marks per Objective	30	30	60
% Weightage	50%	50%	100%

Course Semester End Examination in Semester III Major - Elective Papers: RJSPITE401, RJSPITE402.

Questions	Knowledge & Understanding	Create/ Application and Analyze	Total Marks per Unit
Unit I	3	3	6
Unit II	3	3	6
Unit III	3	3	6
Unit IV	3	3	6
Questions from Topics covering All 4 Units	3	3	6
Total Marks per Objective	6	6	30
% Weightage	50%	50%	100%

Course Semester End Examination in Semester III Major Mandatory and Major Elective Practical Papers: RJSPIT401P, RJSPITE401P and RJSPITE402P.

2. Continuous Evaluation of components which require adequate duration for completion of the task and submission: 50%.
3. Course end Practical Evaluation of skills of students in terms of skill, practical performance and Interpretation: 50%.

Evaluation of Research Project RJSPITRP403

Project and submission of Dissertation wherever mentioned.

Dept. of _____ Course Code _____ Date _____

UID No _____ Roll No _____ Marks _____ /250

Name of student _____

Assessment Grid:
Place one tick in each appropriate row. Overall mark should reflect the positions of ticks in the individual rows. In boxes that have more than one set of marks, cancel out the marks that are not applicable and circle the correct marks.

Project work and report (Parameters)	Marks	80 – 100% Excellent	60 -80% Good	40 – 60% Satisfactory	20 – 40% Average
Project Synopsis	50				
Compilation of Project work done as suggested. **1. Feasibility Study** **2. Requirement Analysis** **3. Designing and Planning** **4. Coding** **5. Testing** **6. Validation & Report**	100				
Implementation and Deployment	50				
Presentation and Viva -Voce	50				
		8-10/10	6-8/10	4-6/10	2-4/10

Mapping of the courses to Employability/ Entrepreneurship/ Skill Development

Course Name	Course Code	Topic focusing on Employability/ Entrepreneurship/ Skill development	Employability / Entrepreneurship / Skill development	Specific Activity
		Semester III		
Cloud Solution Architecture	RJSPIT1301 & RJSPIT301P	**Unit I** Introduction to AWS, Amazon Simple Storage Service (Amazon S3) and Amazon Glacier, Amazon Elastic Compute Cloud (Amazon EC2) and Amazon Elastic Block Store (Amazon EBS), Elastic Load Balancing, Amazon Cloud Watch, and Auto Scaling. **Unit II** Amazon Virtual Private Cloud (Amazon VPC), AWS Identity And Access Management (IAM), Databases and AWS. **Unit III:** SQS, SWF, and SNS, Domain Name System (DNS) and Amazon Route 53, Amazon ElasticCache, Additional Key Services. **Unit IV:** Security on AWS, AWS Risks and Compliance, Architecture Best Practices.	**Skill Development, Employability** 1. Technical skills in AWS cloud for user creation, security policies and groups, DynamoDB, API gateway, Key Management Services, S3 bucket storage handling. 2. Employability skills in AWS Cloud Architect Solution.	The practical sessions to understand, learn and implement the various AWS cloud solution architecture.
Machine Learning	RJSPIT302 & RJSPIT302P	**Unit I** Machine Learning Basics,Feature Selection and Feature	**Skill Development, Employability Skills**	The practical sessions to understand,

		Engineering,Model Evaluation **Unit II** Linear Regression, Trees and Forests **Unit III** K-Nearest Neighbors, Logistic Regression, Support Vector Machines **Unit IV** Naive Bayes, Clustering,Association rule learning	1. Technical Skills in building, evaluating and optimizing machine learning models. 2. Employability skills in handling and analyzing data using machine learning models.	learn and build the various machine learning models.
Robotic Process Automation	RJSPIT402 & RJSPIT402P	**Unit I** Robotic Process Automation, Record and Play, Sequence, Flowchart, and Control Flow **Unit II** Data Manipulation, Taking Control of the Controls **Unit III** Tame that Application with Plugins and Extensions, Handling User Events and Assistant Bots **Unit IV** Exception Handling, Debugging, and Logging, Managing and Maintaining the Code, Deploying and Maintaining the Bot	**Skill Development, Employability Skills** 1. Technical skills in developing workflow to automate tasks using respective tools. 2. Employability skills in the Robotic Process Automation domain.	The practical sessions explore the automation of a particular task, and create and deploy those tasks using RPA tools.
Malware Analysis	RJSPITE301 & RJSPITE301P	**Unit I** Basic Analysis **Unit II** Advanced Static Analysis **Unit III** Advanced Dynamic Analysis **Unit IV**	**Skill Development** 1. Technical skills in doing the analysis of simple malware analysis using static and dynamic techniques and standard tools.	The practical sessions to understand, learn and use the various malware analysis tools

		Malware Functionality		and techniques.
Deep Learning	RJSPITE302 & RJSPITE302P	**Unit I** Applied Mathematics and Machine Learning Basics. **Unit II** Deep Networks **Unit III** Computational Neural Networks, Recurrent Neural Networks **Unit IV** Deep Learning Research	**Skill Development** 1. Technical skills in deciding and designing the various types of neural networks for the real world applications.	The Practical sessions to understand the neural network designing concepts and implement the same.
Semester IV				
Emerging Technologies	RJSPIT401 & RJSPIT401P	**Unit I** Javascript Overview, Node.js. **Unit II** Introduction to React, React Management, React Programming. **Unit III** Advanced React, Advanced Technologies. **Unit IV** Advanced Tools and Systems	**Skill Development, Employability Skills, Entrepreneurship** 1. Technical skills in developing small applications using Javascript, React and Node.js.	The Practical sessions to understand the technology and design and implement an application.
Advanced IOT Practical	RJSPIT303P	**1.** Raspberry Pi (installation) 2.Face Detection using IoT devices 3. Building quality monitoring system. 4. Application monitoring and control system 5.Implement a smart home automation system 6.Interfacing Temperature and	**Skill Development, Employability** 1. Technical and hardware skills to implement and integrate sensors to the development board. 2. Employability skills to own IoT based applications.	The practical session delves into designing IoT applications to solve real world problems.

		Humidity sensor with Cloud 7.Working with IoT cloud platforms 8.Voice Control of Devices using Blynk 9.Create & and implement blockchain on Raspberry Pi		
Cyber Forensics	RJSPITE401 & RJSPITE401P	**Unit I** Computer Forensics, Setting up a lab for Computer Forensics,Recover Data **Unit II** Network Forensics, Virtual Machine Forensics **Unit III** Cloud Forensics **Unit IV** Dropbox analysis, Google Drive	Skill Development, Employability 1. Technical skills in installing and using forensics tools. 2. Employability skills in investigating and analyzing the evidence using forensic tools.	The practical sessions to understand the process of investigation and using tools to investigate and analyze the evidence.
Natural Language Processing	RJSPITE402 & RJSPITE402P	**Unit I** Introduction, Practical Understanding of a Corpus and Dataset **Unit II** Understanding the Structure of a Sentences **Unit III** Pre-processing, Feature Engineering and NLP Algorithms **Unit IV** NLP Applications	**Skill Development, Employability** 1. Technical Skills in understanding and analyzing the language data.	The practical sessions to understand and use the various techniques of analyzing the textual data.
Research Project	RJSPITRP403		**Skill Development, Employability** 1. Technical skills in requirement	The practical session to understand the problem and design

			analysis, designing and implementing the application, perform testing and evaluation of the product. 2. Technical and employability skills with the industry experience.	the practical solution.

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