Savitribai Phule Pune University

(Formerly University of Pune)

Two Year Master's Degree Program in Information Technology

(Faculty of Science & Technology)

Syllabi for

M.Sc.(Information Technology) Part-II

(For Colleges Affiliated to Savitribai Phule Pune University)

Choice Based Credit System (CBCS) Syllabus
Under National Education Policy (NEP)

To be implemented from Academic Year 2024-2025

Savitribai Phule Pune University

Syllabus Structure as per NEP Guidelines

M. Sc. (Information Technology) Part-II from 2024-25

SEMESTER III

Course Type	Course code	Course Name	Credits		Teaching Scheme Hrs/Week		Examination Scheme and Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core	IT-601-MJ	Machine Learning	4	-	4	-	30	70	100
	IT-602-MJ	Information Assurance &Security	4	-	4	-	30	70	100
	IT-603-MJ	Data Analytics	2	-	2	-	15	35	50
	IT-604-MJP	Lab course on Machine Learning	-	2	-	4	15	35	50
	IT-605-MJP	Lab course on Information Assurance & Security	-	2	-	4	15	35	50
Major Elective	IT-610-MJ	NODEJS	2	-	2	-	15	35	50
	IT-611-MJP	Lab Course on NODEJS	-	2	-	4	15	35	50
	OR								
	IT-612-MJ	Cloud Computing	2	-	2	-	15	35	50
	IT-613-MJP	Lab Course on Cloud Computing	-	2	-	4	15	35	50
	OR								
	IT-614-MJ	Cryptocurrency Technologies	2	-	2	-	15	35	50
	IT-615-MJP	Lab Course on Cryptocurrency Technologies	-	2	-	4	15	35	50
Research Project	IT-631-RP	Research Work-I (Research Paper in Conference) (120 hours)	-	4	-	-	30	70	100
		Total	**12**	**10**					

Savitribai Phule Pune University

Syllabus Structure as per NEP Guidelines

M. Sc. (Information Technology) Part-II from 2024-25

SEMESTER IV

Course Type	Course code	Course Name	Credits		Teaching Scheme Hrs/Week		Examination Scheme and Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core	IT-651-MJP	Full Time Industrial Training(IT)	-	16	-	-	120	280	400
Research Project	IT-681-RP	Research work-II (Research Paper in Journal) (180 hrs)	-	6	-	-	45	105	150
		Total	-	22					

Abbreviations

IT	Information Technology		MJ	Major Theory
RM	Research Methodology		MJP	Major Practical
OJT	On Job Training		RP	Research Project
TH	Theory		PR	Practical
CE	Continuous Evaluation		EE	End semester Evaluation
MOOC	Massive Open Online Course			

Savitribai Phule Pune University
M.Sc.(Information Technology)
Sem - III

Course code: IT-601-MJ
Course Title: Machine Learning

No. of Credits: 04   **Teaching Scheme: 4 Hrs/Week**

Prerequisite:
- Familiarity with statistical and mathematical concepts like Probability Theory, Multivariable Calculus, Linear Algebra, Regression
- Programming in Python (NumPy, SciPy, Pandas, Matplotlib, Seaborn, SciKit-Learn, Stats Model)

Course Outcome: On Completion of this course, student will be able to -

CO1: Recognize the characteristics of machine learning that make it useful to real-world problems.

CO2: Process available data using python libraries and predict outcomes using Machine Learning algorithms to solve given problems.

CO3: Able to estimate Machine Learning models efficiency using suitable metrics.

CO4: Implement machine learning algorithms in interdisciplinary fields.

CO5: Aware about reinforcement learning and deep learning concepts

Chapter No.	Course Contents	No. of Hours	CO Targeted
1	**Introduction to Machine Learning** 1.1 Comparative study of Data Science, Artificial Intelligence and Machine Learning 1.2 Types of Data, Key Elements of Machine Learning (Representation, Evaluation and Optimization), Dimensionality Reduction (Feature Reduction) 1.3 Descriptive and Inferential Statistics: Probability, Distribution, Distance Measures (Euclidean and Manhattan), Correlation and Regression, Hypothesis Testing. 1.4 Creating our own dataset, Importing the dataset, Applying Data preprocessing techniques to dataset (missing data handling, training data set and test dataset), Feature Scaling	7	CO1
2	**Machine Learning Models**	6	CO1,CO3

		2.1 Type of Learning- Supervised, Unsupervised and Semi-Supervised Learning 2.2 Components of Generalization Error (Bias, Variance, underfitting, overfitting) 2.3 A Learning System Cycle and Design Cycle 2.4 Metrics for evaluation viz. accuracy, scalability, squared error, precision and recall, Confusion matrix, F-measure likelihood, posterior probability 2.5 Classification Accuracy and Performance		
3	**Regression Models** 3.1 Linear Regression - Simple , Multiple, Polynomial 3.2 Non-linear Regression – Decision Tree, Support Vector, Random Forest	10	CO2,CO4
4	**Classification Models** 4.1 Introduction to Classification 4.2 K – Nearest Neighbours (KNN) 4.3 Logistic Regression 4.4 Naive Bayes Theorem 4.5 Support Vector Machine 4.6 Decision Tree & Random Forest Classification	12	CO2,CO4
5	**Clustering Models and Association Rules** 5.1 Introduction to clustering, Problem faced during clustering 5.2 Concepts of Hierarchical Clustering (Agglomerative, Divisive), Dendrogram, K-Means clustering 5.3 Selecting optimal number of clusters: Within Clusters Sum of Squares (WCSS) by Elbow Method 5.4 Introduction to Association Rule Mining, Market Basket Analysis 5.5 Key Terms: Support, Confidence and Lift 5.6 Apriori Algorithm	12	CO2,CO4
6	**Reinforcement Learning & Deep Learning** 6.1 Introduction to Reinforcement and Deep learning concepts 6.2 Upper Confidence Bound 6.3 Thompson Sampling 6.4 Artificial Neural Network 6.5 Convolution Neural Network 6.6 Recurring Neural Network	13	CO5

Reference Books:

1. Machine learning course material by Andrew Ng, Stanford University
2. Sutton, Richard S., and Andrew G. Barto. Reinforcement learning: An introduction. Vol. 1. No. 1. Cambridge: MIT press, 1998.
3. Rogers, Simon, and Mark Girolami. A first course in machine learning. CRC Press, 2015.
4. Data Mining: Concepts and Techniques (The Morgan Kaufmann Series in Data Management
5. Systems) by Jiawei Han, Micheline Kamber, Jian Pei Professor by Morgan Kaufmann Edition 3
6. Machine Learning - Hands-On for Developers and Technical Professionals.pdf - Google Drive
7. Machine Learning with TensorFlow.pdf - Google Drive
8. Machine Learning for Humans.pdf (everythingcomputerscience.com)
9. Vault Feature 16X9 (youtube.com)
10. [2022] 11 Best YouTube Channels for Machine Learning Beginners - MLK - Machine Learning Knowledge

Savitribai Phule Pune University
M.Sc.(Information Technology)
Sem - III

Course code: IT-602-MJ
Course Title: Information Assurance and Security

No. of Credits: 04   **Teaching Scheme: 4 Hrs/Week**

Prerequisite:
- Basis of ethics, confidentiality and accessibility of information while it is being stored, manipulating or communicated.
- Knowledge or guidance of the policies and practices of information assurance.
- Aware and understanding of basics and domains of Cyber Security.

Course Outcomes: On completion of the course, student will be able to-
  - CO1: To understand the security of the different components of information systems.
  - CO2: To study encryption techniques and their applications in security.
  - CO3: To study and grasping basic IP and Web security protocols such as: IPSec., Secure Socket Layer and Secure Electronic Transactions.
  - CO4: To study and implement the different cyber security mechanisms to help to keep safe of information.
  - CO5: To make students prepared with the technical skill and knowledge which needed to protect and preserve computer systems and networks.

Chapter No.	Course Contents	No. of Hours	CO Targeted
1	**Introduction of Computer Security** 1.1. Security Threats in Information systems 1.2. Programs, operating system, and database security and integrity 1.3. Network security models 1.4. Virus and other malicious programs 1.5. Virus countermeasures 1.6. Intrusion techniques and detection 1.7. Password management 1.8. Hardware vulnerabilities	8	CO1
2	**Basic Concepts and Techniques Information Awareness(IA)**	9	CO1, CO2

	2.1. Information Awareness overview: concepts and trends. 2.2. What is Information Assurance? 2.3. Difference between Information Assurance and Information Security 2.4. Difference between the Functioning of Information Assurance and Information Security 2.5. Advantages of Information Assurance and Information Security 2.6. Information Awareness risk analysis and management. 2.7. Information Awareness in social computing and Information Awareness policies			
3	**Operating System security** 3.1.Models of operating system security 3.2.Design of secure operating systems 3.3. Operating system certification 3.4. User authentication 3.5. Security Functional Components 3.6. Security Assurance Components	8	CO3, CO4	
4	**Database security and integrity** 4.1. Overview and policies for database security 4.2. Authorization techniques Auditing and control 4.3. Information flow model 4.4. Models for database access control 4.5. Data auditing application.	8	CO4	

5	**Encryption techniques**
	
	5.1. Secret key cryptography
	5.2. Stream cipher and Block cipher encryption
	5.3.Advanced Encryption Standard
	5.4. Key distribution& random number generation
	5.5. Public Key cryptography and RSA.
	5.6. Hash functions properties
	5.7. Types of Hash function
	    • SHA1 and SHA2
	    • SHA 256
	    • MD5
	    • CRC32
	5.8. Digital signatures and authorization protocols
	5.9. Digital signature standards
	5.10. Authentication services and protocols
		9	CO3, CO5	

6	**Web Security and IP**	9	CO1, CO3	

	6.1. Authentication protocols 6.2. IP security architecture 6.3. IPSec protocol 6.4. Web security considerations 6.5. Secure Socket Layer and Transport layer Security 6.6. Secure Electronic Transactions			
7	**Information Awareness Policies , Legal and Ethical Issues** 7.1. Information Awareness policies 7.2. Administrative security controls 7.3. Information Awareness (IA) risk analysis and management. 7.4. Disaster recovery planning and Contingency 7.5. Information awareness(IA) evaluation, management, certification, and accreditation 7.6 Information awareness(IA) in service computing , cloud computing, edge computing, social computing and IoT 7.7. Laws and related issues of IA (Information awareness) 7.8. Polices of IA	9	CO4, CO5	

Reference Books:

1. Principles of Information Security By Michael E. Whitman and Herbert J. Mattord
2. Elementary Information Security By Richard E. Smith.
3. Introduction to Cryptography By Johannes Buchmann , Springer
4. Fundamentals of Information Systems Security By David Kim and Michael G. Solomon
5. Foundations of Information Security: A Straightforward Introduction By Jason Andress
6. Information Security: Principles and Practice By Mark Stamp.
7. Design and cryptanalysis of stream and block ciphers By Rabei Becheikh.
8. Information Assurance Handbook: Effective Computer Security and Risk Management Strategies 1st Edition by Corey Schou (Author), Steven Hernandez (Author).
9. Stream Ciphers in Modern Real-time IT Systems: By Alexandr Alexandrovich Kuznetsov, Oleksandr Volodymyrovych Potii, Nikolay Alexandrovich Poluyanenko, Yurii Ivanovich Gorbenko, and Natalia Kryvinska. It was published in 2022 by Springer International Publishing.
10. http://www.commoncriteriaportal.org/files/ccfiles/CCPART2V3.1R4.pdf
11. M. E. Whitman and H. J. Mattord, Principles of Information Security, 6th edition, Thomson Course Technology, 2018

Savitribai Phule Pune University
M.Sc.(Information Technology)
Sem - III

Course code: IT-603-MJ
Course Title: Data Analytics

No. of Credits: 02   **Teaching Scheme: 2 Hrs/Week**

Prerequisite:
- Knowledge of programming languages such as Python or R.
- Knowledge of statistical techniques.
- Analytical and problem-solving skills

Course Outcome: On completion of the course, student will be able to –

    CO1: Understand the Fundamentals of Data Analytics
    CO2: Data Collection and Preprocessing
    CO3: Exploratory Data Analysis (EDA)
    CO4: Machine Learning Basics
    CO5: Big Data and Cloud Computing

Chapter No.	Course Contents	No. of Hours	CO Targeted
1	**Introduction to Data Analytics** 1.1 Overview of Data Analytics in Information Technology 1.2 Importance and applications of Data Analytics 1.3 Types of Data Analytics: Descriptive, Diagnostic, Predictive and Prescriptive Analytics	5	CO1
2	**Data Collection and Preprocessing** 2.1 Data collection methods 2.2 Data sources and types 2.3 Data cleaning and preprocessing techniques 2.4 Handling missing data and outliers	6	CO2
3	**Exploratory Data Analysis (EDA)** 3.1 Techniques for EDA 3.2 Descriptive statistics	5	CO3

	3.3 Data visualization using tools like Matplotlib or Seaborn, or Tableau 3.4 Interpretation of EDA results		
4	**Machine Learning Basics** 4.1 Introduction to machine learning 4.2 Supervised and unsupervised learning 4.3 Classification and regression algorithms 4.4 Model evaluation and validation	7	CO4
5	**Big Data and Cloud Computing for Data Analytics** 5.1 Introduction to Big Data 5.2 Hadoop and Spark 5.3 Cloud computing platforms for data analytics (e.g., AWS, Azure, Google Cloud)	7	CO5

Reference Books:

1. "Data Science for Business" by Foster Provost and Tom Fawcett
2. Big Data: A Revolution That Will Transform How We Live, Work, and Think" by Viktor Mayer-Schönberger and Kenneth Cukier
3. "Python for Data Analysis" by Wes McKinney"

Savitribai Phule Pune University
M.Sc.(Information Technology)
Sem - III

Course code: IT-604-MJP
Course Title: Lab Course on Machine Learning

No. of Credits: 02   **Teaching Scheme: 04 hours/week**

Prerequisite:
- Knowledge of Programming in Python

Course Outcomes: On completion of the course, student will be able to –
   CO1: Use Python libraries to process the available data and utilize Machine Learning
         algorithms to predict results in order to solve the given problem.
   CO2: Able to estimate the effectiveness of Machine Learning models using suitable metrics

Assign. No.	Practical Assignments	CO Targeted
1	Write a python program to Prepare Scatter Plot (Use Insurance Dataset / Iris Dataset) (https://www.kaggle.com/datasets/uciml/iris?select=Iris.csv or https://www.kaggle.com/code/alexisbcook/scatter-plots)	**CO1,CO2**
2	Write a python program to find all null values in a given data set and remove them.(User has to create its own dataset)	**CO1,CO2**
3	Write a python program the Categorical values in numeric format for a given dataset.(Use Housing Dataset) (https://www.kaggle.com/datasets/yasserh/housing-prices-dataset)	**CO1,CO2**
4	Write a python program to implement simple Linear Regression for predicting house price.(Use Housing Dataset) (https://www.kaggle.com/datasets/yasserh/housing-prices-dataset)	**CO1,CO2**
5	Write a python program to implement multiple Linear Regression for a given dataset. (Use Weather dataset) (https://www.kaggle.com/datasets/muthuj7/weather-dataset)	**CO1,CO2**
6	Write a python program to implement Polynomial Regression for a given dataset.(Use Salary Dataset)(https://www.kaggle.com/datasets/mariospirito/position-salariescsv)	**CO1,CO2**
7	Write a python program to implement Naïve Bayes.(Use Iris Dataset) (https://www.kaggle.com/datasets/uciml/iris?select=Iris.csv)	**CO1,CO2**

8	Write a python program to implement a Decision Tree whether or not to play tennis.(Use Tennis Dataset) (https://www.kaggle.com/datasets/shreyakatukuri/tennis)	**CO1,CO2**
9	Write a python program to implement linear SVM. (Use Tennis Dataset) (https://www.kaggle.com/datasets/shreyakatukuri/tennis)	**CO1,CO2**
10	Write a python program to implement k-nearest Neighbors ML algorithm to build prediction model (Use Breast Cancer Dataset) (https://www.kaggle.com/datasets/zzero0/uci-breast-cancer-wisconsin-original)	**CO1,CO2**
11	Write a python program to implement k-means algorithms on a synthetic dataset.(https://www.kaggle.com/datasets/shuvostp/fake-dataset)	**CO1,CO2**
12	Write a python program to implement Agglomerative clustering on a synthetic dataset. (https://www.kaggle.com/datasets/shuvostp/fake-dataset)	**CO1,CO2**
13	Write a python program to implement Apriori algorithm on Super Market Dataset. (https://www.kaggle.com/datasets/aungpyaeap/supermarket-sales)	**CO1,CO2**

Savitribai Phule Pune University
M.Sc.(Information Technology)
Sem – III

Course code: IT-605-MJ
Course Title: Lab Course on Information Assurance and Security

No. of Credits: 02   **Teaching Scheme: 04 hours/week**

Prerequisites:
- Working knowledge of C/C++/JAVA/Python programming.
- Computer Architecture concepts and algorithms and data structure concepts.

Course Outcomes: On completion of the course, student will be able to –
- CO1: To identify and implement network security risks, security design, and monitoring solutions.
- CO2: To implement and execute encryption techniques and applications in security.
- CO3: Learn the sources of computer threats and evaluate practices, tools, and technologies to protect individual network systems

Assign. No.	Practical Assignments
1	Write programs in C/C++/ Java/Python to implemented using several different methods, including the division method, multiplication method, and the folding method.
2	Write programs in C/C++/ Java/Python to implementation of the SHA1 and SHA-2 hashing algorithm.
3	Write programs in C/C++/ Java/Python to implementation of the SHA-256 hashing algorithm.
4	Write programs in C/C++/ Java/Python to implementation of MDS algorithm.
5	Write programs in C/C++/ Java/Python to implementation of Block cipher.
6	Write programs in C/C++/ Java/Python to implementation of stream cipher.
7	Write programs in C/C++/ Java/Python to implementation RSA algorithm.
8	Write programs in C/C++/ Java/Python to implementation of the SHA-256 hashing algorithm.
9	Write programs in C/C++/ Java/Python to implementation network security module needs to be implemented with appropriate virus protection and subsequent upgrade with new emerging virus protection upgrade. Eg. Data kept in database should be

	protected.
10	Write programs in C/C++/ Java/Python to encrypt and decrypt password.
11	Write programs in C/C++/ Java/Python for checking log level eg. Info/warning/error etc.
12	Write programs in C/C++/ Java/Python to implement illustrating a Secure Socket Connection between a Client and a Server.
13	Write programs in C/C++/ Java/Python to implement DIGITAL SIGNATURE SCHEME.
14	Create functions to sign messages using the private key and verify signatures using the public key.
15	Case Study of any one simulation tool related to Information Security eg. Wireshark.
16	Demonstrate INTRUSION DETECTION SYSTEM (IDs) using any tool.(snort or any other s/w)
17	Case Study of packet sniffer tools like Wireshark, ethereal, tcpdump etc. Use the tools to do the following: Observer performance in promiscuous as well as non-promiscuous mode. Show that packets can be traced based on different filters.
18	Use the Nessus tool to scan the network for vulnerabilities.
19	Case Study Security Email – PGP using Gpg4win software to learn how to do file and email encryption.
20	Demonstrate of SQL injection attack. (hint - username *and* password user inputs)
21	Explore N-STALKER- Web security assessment tool.
22	Review papers on Database security, Web security, and Cryptography and Information assurance. (Use Mind map technique).
23	Create functions to perform public key encryption and decryption using OpenSSL libraries.
24	Implement encryption protocols such as SSL/TLS to secure network communication between client and server applications.
25	Information Security Essentials: Study different Case Studies related to CIA triad and make a report for it. Example: Consider an automated teller machine (ATM) in which users provide a personal identification number (PIN) and a card for account access. Give examples of confidentiality, integrity, and availability requirements associated with the system and, in each case, indicate the degree of importance of the requirement. *Note: Case Study is not limited to only this one, can take any case study from reference books.*

Savitribai Phule Pune University
M.Sc.(Information Technology)
Sem – III

Course code: IT-610-MJ
Course Title: NodeJS

No. of Credits: 02   **Teaching Scheme: 02 hours/week**

Prerequisite:
- Knowledge of HTML, CSS, JavaScript basics

Course Outcomes: On Completion of this course, student will be able to –
  CO1: Learn installation and basics of NodeJS.
  CO2: Learn REPL for CLI interface of NodeJS.
  CO3: Learn Core of NodeJS.
  CO4: Learn and Understand Modules of NodeJS.
  CO5: Learn Control Flow, Asynchronous Patterns, and Exception Handling.
  CO6: Learn Express Framework.
  CO7: Learn Express, Template Systems, and CSS.
  CO8: Learn Node and MongoDB.
  CO9: Learn to use Graphics and HTML5 Video in NodeJS.

Chapter No.	Course Contents	No. of Hours	CO Targeted
1	**Node.js: Up and Running** 1.1 Introduction to NodeJS- History , Features and Advantages 1.2 Setting Up a Node Development Environment 1.3 Hello, World in Node 1.4 Hello, World from the Top 1.5 Asynchronous Functions and the Node Event Loop 1.6 Reading a File Asynchronously 1.7 Taking a Closer Look at Asynchronous Program Flow	2	CO1

2	**Interactive Node with REPL**	3	CO2
	2.1 REPL: First Looks and Undefined Expressions 21 2.2 Benefits of REPL: Getting a Closer Understanding of JavaScript Multiline and More Complex JavaScript 2.3 REPL Commands 2.4 REPL and rlwrap 2.5 Custom REPL 2.6 Stuff Happens—Save Often		
3	**The Node Core**	4	CO3
	3.1 Globals: global, process, and Buffer 3.2 The Timers: setTimeout, clearTimeout, setInterval, and clearInterval 3.3 Servers, Streams, and Sockets 3.4 Streams, Pipes, and Readline 3.5 Child Processes 3.6 Running a Child Process Application in Windows 3.7 The Utilities Module and Object Inheritance 3.8 Events and Event Emitter		
4	**The Node Module System**	4	CO4
	4.1 Loading a Module with require and Default Paths 4.2 External Modules and the Node Package Manager 4.3 Finding Modules 4.4 Colors: Simple Is Best 4.5 Optimist: Another Short and Simple Module 4.6 Underscore 4.7 Creating Your Own Custom Module 4.8 Packaging an Entire Directory 4.9 Preparing Your Module for Publication 4.10 Publishing the Module		
5	**Control Flow, Asynchronous Patterns, and Exception Handling**	3	CO5
	5.1 Promises, No Promises, Callback Instead 5.2 Sequential Functionality, Nested Callbacks, and Exception Handling 5.3 Asynchronous Patterns and Control Flow Modules 5.4 Step		

	5.5 Async			
	5.6 Node Style			
6	**The Express Framework**	5	CO6	
	6.1 Express: Up and Running			
	6.2 The app.js File in More Detail			
	6.3 Error Handling			
	6.4 A Closer Look at the Express/Connect Partnership			
	6.5 Routing			
	6.6 Routing Path			
	6.7 Routing and HTTP Verbs			
	6.8 Cue the MVC			
	6.9 Testing the Express Application with cURL			
7	**Express, Template Systems, and CSS**	3	CO7	
	7.1 The Embedded JavaScript (EJS) Template System			
	7.2 Learning the Basic Syntax			
	7.3 Using EJS with Node			
	7.4 Using the EJS for Node Filters			
	7.5 Using a Template System (EJS) with Express			
	7.6 Incorporating Stylus for Simplified CSS			
8	**Node and MongoDB**	3	CO8	
	8.1 The MongoDB Native Node.js Driver			
	8.2 Getting Started with MongoDB			
	8.3 Defining, Creating, and Dropping a MongoDB Collection			
	8.4 Adding Data to a Collection			
	8.5 Querying the Data			
	8.6 Using Updates, Upserts, and Find and Remove			
9	**Working with Pdf**	3	CO9	
	9.1 Creating and Working with PDFs			
	9.2 Accessing PDF Tools with Child Processes			
	9.3 Creating PDFs with PDFKit			

Reference Books:
1. Learning Node, Shelley Powers,Oreilly
2. Web Development with Node & Express: Leveraging the JavaScript Stack, Ethan Brown, second edition.Oreilly

3. Node.js Web Development: Server-Side Web Development Made Easy with Node 14 Using Practical Examples, Author: David Herron, Publishing:Packt fifth Edition
4. Beginning Node.js, Express & MongoDB Development, Author: Greg Lim
5. http://es6-features.org/
6. https://www.typescriptlang.org/
7. https://angular.io/
8. https://expressjs.com/

9. https://nodejs.org
10. https://www.w3schools.com/
11. https://www.tutorialspoint.com
12. https://www.tutorialsteacher.com/
13. https://www.geeksforgeeks.org/
14. https://www.javatpoint.com/
15. https://www.codeproject.com/

Savitribai Phule Pune University
M.Sc.(Information Technology)
Sem – III

Course code: IT-611-MJP
Course Title: Lab Course on NodeJS

No. of Credits: 02   **Teaching Scheme: 04 hours/week**

Prerequisite:

* Knowledge of HTML, CSS, JavaScript basics

Course Outcomes: On Completion of this course, student will be able to –

CO1: Learn installation and basics of NodeJS.

CO2: Learn REPL for CLI interface of NodeJS.

CO3: Learn Core of NodeJS.

CO4: Learn and Understand Modules of NodeJS.

CO5: Learn Control Flow, Asynchronous Patterns, and Exception Handling.

CO6: Learn Express, Template Systems, and CSS.

CO7: Learn Node and MongoDB.

CO8: Learn to use Graphics and HTML5 Video in NodeJS.

Assign. No.	Practical Assignment
1	Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3 features, flex and grid.
2	Use JavaScript for doing client – side validation of the pages implemented in the experiment.
3	Explore the features of ES6 like arrow functions, callbacks, promises, async/await. Implement an application for reading the weather information from openweathermap.org and display the information in the form of a graph on the web page.

4	Create a custom server using http module and explore the other modules of Node JS like OS, path, event.
5	Develop an express web application that can interact with REST API to perform CRUD operations on student data. (Use Postman)
6	Create a service in react that fetches the weather information from open weathermap.org and the display the current and historical weather information using graphical representation using chart.js.

Savitribai Phule Pune University
M.Sc.(Information Technology)
Sem - III

Course code: IT-612-MJ
Course Title: Cloud Computing

No. of Credits: 02   **Teaching Scheme: 02 hours/week**

Course Outcomes: On Completion of this course, student will be able to –
CO1: To understand fundamentals of cloud computing.
CO2: To understand the functionalities of Virtualization and containerization.
CO3: To understand the implementation of different Cloud services.
CO4: To architect, deploy, and manage networking components, compute services, and storage resources.
CO5: To architect, configure, and manage core application services, object-level storage services, and database resource types.
CO6: To gain the knowledge required to maintain PaaS workloads.
CO7: To set up a public load balancer and a site-to-site (hybrid) virtual private network.
CO8: To apply metrics and formulas in performing accurate financial analysis of cloud adoption plans.

Chapter No.	Course Contents	No. of Hours	CO Targeted
1	**Introduction to Cloud Computing** 1.1. What is Cloud Computing? 1.2. History of Cloud Computing 1.3. Characteristics of Cloud Computing 1.4. Architecture of Cloud Computing 1.5. Fundamental concepts and models 1.6. Roles and Boundaries: Cloud Provider, Cloud Consumer, Cloud Service Owner, Cloud Resource Administrator	6	CO1, CO3

	1.7. Cloud Service Models : Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS)		
	1.8. Types of Cloud Computing- Private, Public, Hybrid and Community		
	1.9. Cloud Platforms and Technologies - Service Providers		
	1.10. Difference between AWS, Azure, and Google Cloud Platform		
	1.11. Economics of the cloud		
	1.12. Cloud Computing Open challenges		
2	**Virtualization and Containerization in Cloud Computing** 2.1. Virtualization in Cloud Computing 2.2. Concept of Hypervisors 2.3. Types of Virtualization: Hardware Virtualization- Full, Para and Partial, Operating system Virtualization, Server Virtualization, and Storage Virtualization. 2.4. Multitenancy in Cloud computing 2.5. Multitenant Cloud vs. Single-Tenant Cloud 2.6. Benefits of multitenant architecture 2.7. Containerization in Cloud Computing 2.8. What is Container? 2.9. Container Orchestration 2.10. Orchestration tools 2.11. Containerization Vs Virtualization 2.12. Introduction to Docker 2.13. Introduction to Kubernetes	6	CO2, CO3
3	**Implementing Cloud Deployment Models** 3.1. Developing Infrastructure Services Using Public Cloud Providers (IaaS): Factors and Architectural considerations for Networking, Compute and Storage Services 3.2. Developing Platform Services Using Public Cloud Providers (PaaS) : configure, and manage core application services, and database resource types 3.3. Utilizing Turnkey Software Solutions (SaaS) : configure and utilize at a high level core AmazonWorkDocs and Google Docs services	8	CO3, CO4, CO5, CO6

	3.4. Launching Compute Service Resources for Scalability: to set up a virtual machine, web application services, and container services		
4	**Cloud Security**	5	CO3, CO7
	5.1. Fundamental Cloud Security: Confidentiality, Integrity, Authenticity, Availability, Threat, Vulnerability, Risk, Security Controls, Security Mechanisms, Security Policies		
	5.2. Basics : Threat Agents, Anonymous Attacker, Malicious Service Agent, Trusted Attacker, Malicious Insider		
	5.3. Threat agents: Traffic Eavesdropping, Malicious Intermediary, Denial of Service, Insufficient Authorization, Virtualization Attack, Overlapping Trust Boundaries, Risk Management		
	5.4. Cloud security threats		
	5.5. Identity Management and Access Control		
	5.6. Shared Responsibility Model		
	5.7. Implementing Virtual Network Resources for Security		
5	**Cost Metrics and Pricing Models**	**5**	CO2, CO8
	6.1. Introduction		
	6.2. Business Cost Metrics		
	6.3. Cloud Usage Cost Metrics : Network Usage, Server Usage, Cloud Service Usage		
	6.4. Cost Management Considerations : Pricing Models, Additional Considerations		
	6.5. Service-level agreements (SLAs)		
	6.6. Service Quality Metrics: Service Availability Metrics, Service Reliability Metrics, Service Performance Metrics, Service Scalability Metrics, Service Resiliency Metrics		

Reference Books:

1. Mastering Cloud Computing: Foundations and Applications Programming by Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi
2. Cloud Computing: Theory and Practice Paperback by Dan C. Marinescu
3. Cloud Computing Demystified for Aspiring Professionals: Hone your skills in AWS, Azure, and Google cloud computing and boost your career as a cloud engineer by David Santana
4. Cloud Computing Concepts, Technology & Architecture Thomas Erl,Zaigham Mahmood, and Ricardo Puttini

Savitribai Phule Pune University
M.Sc. (Information Technology)
Sem-III

Course code: IT-613-MJP
Course Title: Lab Course on Cloud Computing

No. of Credits: 02   **Teaching Scheme: 04 hours/week**

Prerequisites:
- Operating System
- Fundamentals of Computer Networks
- Good Understanding of Object Oriented Programming Concepts.

Course Outcomes: On Completion of this course, student will be able to –

CO1: To understand the principles of cloud computing.

CO2: To understand the importance of virtualization and how it has helped the development of cloud computing.

CO3: To understand the concept of cloud security.

CO4: To design and deploy cloud infrastructure.

Assign No.	Practical Assignment
1.	Install Virtual Box/VMware Workstation with different flavors of Linux or Windows OS on top of Ubuntu or Windows10.
2.	Create a Virtual Machine using Virtual Box.
3.	Working and Implementation of Infrastructure as a service using (Virtual Box / AWS/ Azure/GCS)

4.	Working and Implementation of Software as a service. (Virtual Box / AWS/ Azure/ GCS)
5.	Working and Implementation of Platform as a services. (Virtual Box / AWS/ Azure /GCS)
6.	Practical Implementation of File sharing and Storage as a Service. (Google Drive)
7.	Create Google form for accepts details of student and create test page and generate result.
8.	Installation and configure Google App Engine.
9.	Creating an Application in SalesForce.com using Apex Programming Language.
10.	Working and Implementation of identity and Access management.
11.	Create and host static web page using any cloud provider.
12.	Write a program for web feed(using Apache, Mysql, Php).
13.	Install Hadoop single node cluster and run simple application like word count.
14.	Implement VMWareESXi Server.
15.	Practical Implementation of cloud security.
16.	Managing and working of cloud xen server.
17.	Using OpenNebula to manage heterogeneous distributed data centre Infrastructure.

Savitribai Phule Pune University
M.Sc. (Information Technology)
Sem- III

Course code: IT-614-MJ
Course Title: Cryptocurrency Technologies

No. of Credits: 02   **Teaching Scheme: 02 hours/week**

Course Outcome: On Completion of this course, student will be able to –
  CO1: To understand the basics of crypto currency.
  CO2: To describe the regulations and legal aspects of crypto currency.
  CO3: To acquire knowledge about Crypto currency mining.
  CO4: To Study environmental impact and mitigations of crypto currency.
  CO5: To Gain Knowledge about the performance measures of crypto currency.
  CO6: To obtain the knowledge about different applications of crypto currency in real world.

Chapter No.	Course Contents	No. of Hours	CO/PO Targeted
1	**Crypto currency** History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin	5	CO1
2	**Cryptocurrency Regulation** Stakeholders, Roots of Bitcoin, Legal Aspects - Cryptocurrency Exchange, Black Market and Global Economy	6	CO2
3	**Cryptocurrency Ecosystem** Introduction to Altcoins Merged Mining	6	CO3

	Relationship Between Bitcoin and Altcoins Atomic Cross-Chain Swaps		
4	**Cryptocurrency Mining** What is Crypto currency mining? Different types of crypto currency mining Current Layout of the mining space - individual, commercial, and enterprise mining Crypto Mining's current environmental impact – energy use, e-waste Environmental impact mitigation strategies - Home/individual miners Environmental impact mitigation strategies - Commercial/enterprise	7	CO3, CO4
5	**Crypto economics Survey** Introduction, Use, Speed of blocks, Ether insurance scheme, common attack scenarios. Crypto currencies& the real world: Smart property, data feeds, and public randomness Applications of crypto currencies	6	CO5, CO6

References Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).
2. Wattenhofer, The Science of the Blockchain
3. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
4. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
5. DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellow paper.2014.
6. Nicola Atzei, Massimo Bartoletti, and TizianaCimoli, A survey of attacks on Ethereum smart contracts

Savitribai Phule Pune University
M.Sc. (Information Technology)
Sem- III

Course code: IT-615-MJP
Course Title: Lab Course on Cryptocurrency Technologies

No. of Credits: 02   **Teaching Scheme: 04 hours/week**

Course Outcome: On Completion of this course, student will be able to –
   CO1: To gain practical experience in setting up and managing crypto currency wallets.
   CO2: To understand the process of crypto currency transactions and transaction verification.
   CO3: To develop and deploy smart contracts on block chain platforms.
   CO4: To analyze real-world crypto currency transactions and block chain data.
   CO5: To design and implement crypto currency-related projects.

Assign. No.	Practical Assignments
1	Introduction to Crypto currency Tools and Environments: • Installation of Ganache,Flask and postman • Installation and setup of crypto currency wallets (eg. Metamask, Bitcoin core)
2	Crypto currency Transaction and wallets: • Creating crypto currency wallets and addresses • Sending and receiving crypto currency transactions • Understanding transaction fees and confirmations
3	Crypto currency Mining: • Setting up crypto currency mining node (eg.Bitcoin,Ethereum) • Simulating mining activities using test networks • Analyzing mining rewards and difficulty adjustments.
4	Decentralized Application Development • Developing decentralized applications (DApps) on blockchain platforms • Interacting with smart contracts using web.js or ether.js • Deploying and testing Dapps on local and test networks.
5	Case Studies**:**

	1. Develop a smart contract for a decentralized voting system where users can cast votes securely. Implement features like voter registration, vote casting and result verification.
	2. Create a smart contract to track and manage supply chain of a product on the block chain. Include functionalities like recording product details, tracking its journey and validating authenticity.
	3. Build a simple decentralized lending or borrowing platform using smart contracts. Include features like creating loans, borrowing assets and interest rate mechanisms.
	4. Create a smart contract for an NFT marketplace where users can buy, sell and trade unique digital assets. Include features for minting new NFT's transferring ownership and viewing ownership history.

Recommended Tools and Platforms:
- Ethereum development tools (Remix, Truffle, Ganache)
- Blockchain test networks (Rinkeby, Ropsten, Kovan)
- Cryptocurrency wallets (MetaMask, Trust Wallet)
- Blockchain explorers (Etherscan, Blockchain.com)

Recommended Resources:
- Official documentation and tutorials of blockchain platforms (e.g., Ethereum, Bitcoin)
- Online tutorials and courses on smart contract development and DApp development
- Research papers and articles on cryptocurrency mining, smart contracts, and blockchain data analysis.
- https://solidity-by-example.org/

Savitribai Phule Pune University
M.Sc. (Information Technology)
Sem- III

Course code: IT-631-RP
Course Title: Research Work-I
Research Paper in Conference

No. of Credits: 04   **Total Duration: 120 Hours**

Course Outcomes: On Completion of this course, student will be able to -

CO1: Independently conduct research in a specific area of information technology.

CO2: To understand basic structure of research paper. (Understand)

CO3: To utilize a strategic approach when engaging with research projects. (Apply)

CO4: To enable students to design and Present research paper effectively. (Create)

"Guidelines for Presenting and Publishing the Research Paper in Conference"

Conference paper:
- A conference paper can be written while research is ongoing. It can present preliminary results and gain informal feedback to use in your research.
- Conference papers are typically shorter than journal articles, with less detail and fewer references.
- Conference proceedings may be published as a book (with an assigned ISBN), special issue of a journal, or a serial (with an assigned ISSN).
- Discipline practices and the quality of the conference and conference publications should be a consideration when attending a conference.

Step 1: Finding Quality conference with open calls for paper

1. **Consult Academic Databases**: Explore academic databases such as IEEE Xplore, ACM Digital Library, PubMed, Scopus, and Google Scholar. These databases often list upcoming conferences and provide information about their submission deadlines, topics, and past proceedings.

2. **Check Professional Society Websites**.

3. **Use Conference Aggregator Websites**: Websites like ConferenceAlerts, WikiCFP, and Conference Monkey aggregate information about conferences across different disciplines.

4. **Review Conference Rankings**

5. **Check University Websites**

6. **Review Conference Proceedings**

Step 2: Write and Send Proposal

1. The conference proposal is a stand-alone document—independent from your written paper or presentation—that proposes your presentation for a conference.

2. Word count for proposal preferably 100-500 words (As per conference guideline) The primary audience for a conference proposal is the review committee or conference organizer.

3. The secondary audience is conference attendees (abstracts are generally listed in conference programs). The purpose of the proposal is to create a "research space" for yourself, and to appeal to your primary audiences so it will be accepted.

4. Define the problem you are addressing clearly and concisely.

5. Research work must be aligning with conference theme.

6. Properly check and follow the Requirements for abstracts/proposals and Deadlines for submission.

Step 3: Writing Paper

1. **TITLE PAGE**

The first page should contain the manuscript's title, the complete name of all authors (first name, middle initials, surname), the departmental and institutional affiliations and complete street or mailing addresses of all authors, the telephone and fax numbers and email address for the corresponding author, and the city, state and country where the work was performed.

2. **Abstract**

The Abstract should be an accurate, stand-alone summary of the contents of the paper. It should be a factual, not descriptive, statement of study objectives, methods, principal results, and conclusions

Instructions:
  i. The abstract should be between 150 and 300 words, use single line spacing, as a single column and JUSTIFIED throughout.
  ii. It must be written as a single paragraph, and not contain displayed mathematical equations, tables or figures.
  iii. Ensure that your abstract reads well and is grammatically correct.
  iv. Set font size and type as per conference guidelines.

3. Keywords

It is essential that you supply up to ten keywords that best describe the unique content of your paper. These will be used as part of the search facility in the online version. The Keyword heading, together with the chosen words, should appear on a new line immediately following the last line of the abstract, without a line space.

4. Introduction

Introduction text On a new line, without a space, start the text of the introduction.

Instructions:

  i. Set font size, font type and Single/double column details as per conference manuscript instructions
  ii. Throughout the paper a standard Headings style must be followed for Main, Second level headings and Third level headings.

TABLES AND FIGURES.

  i. **Tables.** A short descriptive title should appear above each table with a clear legend. Tables must be numbered consecutively from the beginning of the paper, with the table number and the captionseparated by a colon.
     a. **For example, Table 1: Caption**
  ii. **Figures**. Figures must be numbered consecutively from the beginning of the paper. All figures must have a suitable caption.
  iii. All figures and tables must be cited in the text. Citations to figures in the text always carry the abbreviation 'Fig.' followed by the figure number.

ABBREVIATIONS, SPELLING AND UNITS.

All nomenclature should be consistent, clear, unambiguous and accordance with the rules constituted in a given branch. Authors should, whenever possible, conform to the

nomenclature, symbols and abbreviations established by concern standard organization. Like for Chemistry and Physics abbreviations established by IUPAC and IUPAP.

Note: Standard Conference submission required that Tables and figures should not be embedded in the text, but should be included as separate sheets or files.

5. Literature Review

i. Consider your specific area of study. Think about what interests you and what interest's other researchers in your field. Talk to your professor, brainstorm, and read lecture notes and recent issues of periodicals in the field.

ii. Limit your scope to a smaller topic area, Consider and write only that points literature review which are surrounding of your research questions.

iii. Define your source selection criteria (i.e. articles published between a specific date range, focusing on a specific geographic region, or using a specific methodology).

iv. Reference lists of recent articles and reviews can lead to other useful papers.

v. Make certain that all of the citations and references are correct and that you are referencing in the appropriate style as per guidelines of conference for manuscripts.

vi. Check to make sure that you have not plagiarized either by failing to cite a source of information, or by using words quoted directly from a source. (Usually if you take three or more words directly from another source, you should put those words within quotation marks, and cite the page.)

6. Research Methodology

i. **Introduction of Methods:** Describe the methodological approach employed to investigate the research problem, which may be quantitative, qualitative, or a combination of both.

ii. **Methodological Connection:** Justify the chosen methodological approach in relation to the overall research design, ensuring alignment with the research objective and addressing the presented problem.

iii. **Introduction of Instruments:** Identify the research instruments utilized for data collection, such as surveys, questionnaires, observations, etc. Additionally, provide insight into any archival research or existing data analysis, including background information and maintenance of data logs.

iv. **Analysis Discussion:** Outline the methodology for analyzing the gathered data, considering statistical analysis or theoretical perspectives to support interpretations of observed behaviors.

v. **Background Information:** Provide necessary background information on less familiar methods to ensure clarity and comprehension within the research context, along with defining the research methodology.

vi. **Sampling Process Discussion:** Justify the chosen sampling procedure, including reasons for selection methods and procedures for participant selection and interview conduct.

vii. **Addressing Research Limitations:** Acknowledge and address potential limitations that may affect the research process or data gathering, including practical constraints.

viii. **Results:** Present collected data and the results of any statistical tests performed, possibly preceded by a description of the analysis procedure. If multiple experiments were conducted, consider providing separate sections for each.

ix. **Discussion:** Summarize study results, linking them to the research topic or issues addressed. Expand upon implications, address limitations, and suggest directions for future research.

x. **Conclusion:** Summarize key points of the paper, restating the central research question or hypothesis and highlighting main contributions or implications. Avoid introducing new information or repeating previously discussed points.

xi. **References**: Include a list of all sources cited within the paper, following the appropriate citation style guidelines.

- List all cited sources using a consistent citation style.
- Each reference should follow referencing style suggested by Conference for publishing manuscripts.

Step 4: Submitting paper

1. **Online Submission:** Most conferences use online submission systems where authors can submit their papers electronically. These systems often include features for managing submissions, such as tracking the status of submissions, handling revisions, and facilitating communication between authors and reviewers. Content Management Systems (CMS) are

widely used for managing paper submissions in academic conferences. Some of the widely used CMS are EasyChair, ConfTool, OpenConf and PaperPlaza etc.

a. Before submitting the paper at a conference, Ensurethat it has been read carefully for typographical and grammatical errors. Students can use supporting software for language editing, proofreading, typesetting, adding graphics, converting the file into standard formats and creating metadata as required.

b. In research paper, editors and reviewers of a conference always look on some points like appropriate content in scope and level, clearly written original material, valid method and rationale, original results, illustrations, tables and graphs that support the text, references that are current and relevant to the subject etc.

c. Follow the given instruction given by publisher about manuscript structure, format and template.

d. Check the citation and referencing style.

e. Be ready to accept if any changes suggested by Publisher.

2. **Review process**
   a. Once the paper is submitted, the editor goes through content match check and banned author check.
   b. If the paper is in scope, it is assigned to 2 or more reviewers.
   c. Reviewers send their comments back to the editor.
   d. Editor makes the final decision and informs the corresponding author if the paper is: accepted, accepted for review, or refused.
   e. And allow time to rework or response to reviewer's comments.

Step 5: Paper Presentation

1. Upon acceptance of their paper by a conference, students are required to prepare for a presentation.
2. Depending on their area of study, students may choose to write a script or utilize visual aids like PowerPoint presentations to present their research work.
3. It is important for students to practice their presentation to ensure it fits within the designated time frame and adheres to the specified number of slides set by the conference.
4. Due to the interdisciplinary nature of certain conferences, both papers and presentations may vary significantly.

5. Students should present their research findings in a manner that encourages a thorough discussion.
6. In some cases, students may need to provide a longer draft to the Discussant.
7. When doing so, students must communicate to the Discussant the specific areas they will focus on during their presentation, enabling the Discussant to tailor discussion points accordingly.

Annexure-I
Schedule to be used by Students for Strategic planning of Research Paper writing

Sr.	Targeted Milestone	Action Required	Action taken by student	Planned Date	Date of Completion
1	Identification of Problem	Day to day or Technical Problem Identification-Finalisation by discussion with Guide			
2	Literature Review	Study of relevant Research papers and Articles			
3	Finalising Paper title	On the basis of understating finalising the title			
4	Data collection	Collection of Primary, Secondary data by using appropriate tools			
5	Research Methodology	Conduction of experiment			
6	Result analysis	Use of different tools for result analysis			
7	Analysis Interpretation	Presenting analysis by using Graph or tables			
8	Review Title and Finalised. Finalised main headings of research paper	Finalising Title of Paper as per research done			
9	Writing content for main headings	Content Writing			

10	Formatting the Paper as per instruction of targeted conference	Can be used automated editor for research paper formatting like Zotero, LaTeX , EndNote etc.			

Savitribai Phule Pune University
M.Sc. (Information Technology)
Sem- IV

Course code: IT-651-MJP
Course Title: Full Time Industrial Training (IT)

No. of Credits: 16   **Total Duration: 480 Hours**

Objectives
- To provide students with an opportunity to apply theoretical knowledge gained throughout the program in a real-world industrial setting
- To foster professional skills such as teamwork, communication, time management, and problem-solving in an industrial environment.
- To expose students to the practices, technologies, and challenges prevalent in the IT industry or related sectors.
- To enable students to gain hands-on experience by working on projects or tasks relevant to their field of study.
- To facilitate networking opportunities with professionals in the industry, potentially leading to future career prospects.

Course Outcomes: On Completion of this course, student will be able to –
CO1: Apply theoretical concepts learned in the classroom to solve practical problems encountered in an industrial setting.
CO2: Demonstrate proficiency in using industry-standard tools, technologies, and methodologies relevant to their area of specialization.
CO3: Apply analytical and problem-solving skills to address challenges encountered during the industrial training
CO4: Collaborate effectively with team members to achieve project goals and objectives.
CO5: Manage time and resources efficiently to complete assigned tasks and projects within the stipulated timeframe.
CO6: Prepare a comprehensive report documenting their experience, including project details, learnings, and reflections.

Sr. No.	Guidelines for Full Time Industrial Training (IT)
1	Students are required to secure an industrial/internship placement in any organization, institution, or IT industry relevant to their field of study.
2	Students must submit the offer letter from the organization within two weeks of starting the industrial training/internship, detailing the terms and duration of the internship.
3	Students must have to work full time in the organization as per their rules and regulations.
4	A mentor will be assigned to each group of students to provide guidance and support throughout the internship period.
5	The industrial training/ internship duration should span a minimum of 360 hours, equivalent to 12 credits.
6	Students may be assigned specific projects or tasks or assignments by the host organization, relevant to their area of specialization.
7	Students should provide regular updates to their mentor through progress reports time to time regarding their progress, challenges faced, and lessons learned during the industrial training.
8	Upon completion of the industrial training/ internship, students must submit a comprehensive report documenting their internship experience, including project/ assignment details, challenges and achievements as per the format specified.
9	Evaluation will be based on the quality content of the internship report, feedback from the host organization, and the overall performance during the internship/ industrial training period.

Evaluation Pattern:

- Internal assessment will be carried by college guide/ mentor by continuous evaluation method.
- The final examination or presentation of the work carried during the training/internship period will be in front the panel of examiners as per the schedule given by University.
- There will be a panel of three examiners for the final assessment

1. Industry expert (Appointed by the college)
2. Academic expert (Appointed by the University)
3. College guide/Mentor of the student as an internal examiner

Parameters for Evaluation	Marks
Internal Assessment by Mentor Regular updates, timely report submission and deliverable (40 Marks) Professional Conduct, Learning and Skill Development (40 Marks) Work Undertaken and Learning Outcomes (40 Marks)	**120**
External Assessment by Industry expert and Academic expert	**280**
Relevance and significance of the project or tasks undertaken (50 Marks) Technical proficiency demonstrated during the internship (50 Marks) Communication skills and presentation of the internship experience (50 Marks) Work Undertaken and Quality of the internship report (50 Marks) Overall performance and contribution to the organization (80 Marks)	
Total Assessment	**400**

Savitribai Phule Pune University
M.Sc.(Information Technology)
Progress Report for IT-651-MJP: Full Time Industrial Training (IT)
(This Progress report is to be submitted monthly to the college guide/Mentor)

Name of College	
Roll No./ID and Name of Student	
Date of Report Submission	
Duration of Report (From date – To date)	
Name of Organization	
Date of Joining in the organization	
Name of Industry Guide/Supervisor	
Name of College Guide/Mentor	

1. Introduction*(Mention brief overview of the internship objectives and the role of the student within the organization)*

2. Work Undertaken*(Summary of the tasks or assignments or projects undertaken by the student during the reporting period with responsibilities assigned and progress made on each task)*

3. Learning and Skill Development*(Mention the summary of new skills, knowledge, and experiences gained during the reporting period)*

4. Challenges Faced*(Put any challenges or obstacles encountered during the reporting period and Strategies adopted to overcome these challenges and lessons learned from them)*

5. Achievements and Contributions*(Highlight of notable achievements, contributions, or successes attained during the reporting period)*

6. Future Plan *(Specify future goals and objectives for the remaining period of the internship. Also put the plan of action to address any identified areas for improvement or skill enhancement)*

Signature: **Signature:**

Date: **Date:**

Name: **Name:**

Industry Guide/Mentor   **College Guide/Mentor**

Savitribai Phule Pune University
M.Sc. (Information Technology)
Sem- IV

Course code: IT-681-RP
Course Title: Research work-II
Research Paper in Journal

No. of Credits: 06   **Total Duration:180 Hours**

Course Outcomes: On Completion of this course, student will be able to -

CO1: Independently conduct research in a specific area of information technology.

CO2: Apply appropriate research methodologies to address research problems.

CO3: Analyze and synthesize information gathered from literature reviews, experiments, or data analysis

CO4: Develop innovative solutions to research problems within the scope of Information technology.

CO5: Effectively present research findings through written reports, oral presentations, or poster presentations.

CO6: Publish research work in reputable journals.

Sr. No.	Guidelines for Research Work
1	Each student carry out the research work during semester-IV under the guidance of mentor or guide appointed.
2	Student shall work on a research problem and publish paper(s) or article(s) or file a copyright or patent based on the work carried out.
3	Students are required to conduct a thorough literature review to understand the current state of research in their chosen area.
4	Students should execute the research plan outlined in their proposal, adhering to ethical guidelines and academic standards.
5	Proper documentation of the research process, including experimental setup, data collection methods, and analysis techniques, should be maintained
6	Upon completion of the research work, students must prepare a report
7	Evaluation will be as per the University guidelines, based on the quality of the research work, adherence to the research plan, presentation skills, and contribution