Savitribai Phule Pune University

(Formerly University of Pune)

Two year M.Sc. Degree Program in Computer Science

(Faculty of Science & Technology)

M.Sc.- II (Computer Science)

Choice Based Credit System Syllabus

To be implemented from Academic Year

2020-2021

Year/ Sem	Course Type	Course Code	Course Name	Credit	% of Assessment		
					IA	UE	Total
II Year Sem-III	Core Compulsory Theory Paper	CSUT231	Software Architecture and Design Patterns	4	30	70	100
		CSUT232	Machine Learning	4	30	70	100
		CSUT233	Web Frameworks	4	30	70	100
	Choice Based Optional Paper	CSDT234A	Big Data Analytics	2	15	35	50
		CSDP234A	Big Data Analytics Practical	2	15	35	50
		OR					
		CSDT234B	Web Analytics	2	15	35	50
		CSDP234B	Web Analytics Practical	2	15	35	50
		OR					
		CSDT234C	Project	2	15	35	50
		CSDP234C	Project related Assignments	2	15	35	50
	Core Compulsory Practical Paper	CSUP235	Practical on CSUT231, CSUT232 and CSUT233	4	30	70	100

Year/ Sem	Course Type	Course Code	Course Name	Credit	% of Assessment		
					IA	UE	Total
II Year Sem-IV	Core	CSUIT241	Industrial Training /Institutional project	20	**150**	**350**	**500**

IA :- Internal Assessment, UE :- University Examination

CSUT231- Software Architecture and Design Patterns Total Credits - 4

Pre-requisites

- Familiarity with UML and OOPs Concepts
- Programming in Java

Course Objectives:

- To introduce students to the basic concepts and techniques of SADP.
- To write java programs using Design Pattern and Frameworks to create reusable and flexible software systems.
- Use of patterns and architectures for solving practical problems.
- To understand about design pattern.
- To understand about the process of deploying web apps using specific Frameworks.

Course Outcomes:

- Recognize the characteristics of patterns that make it useful to solve real-world problems.
- Process available data using python libraries and predict outcomes using Machine Learning algorithms to solve given problem.
- Able to use specific frameworks as per applications need.
- Design java application using design pattern techniques.

Chapter No.	Topics	# Lectures
1.	**Introduction**	**2**
1.1	UML The Notation	
1.2	Process Unified Process / Rational Unified Process inception, elaboration, construction, transition	
1.3	How various components fit in the life cycle The artifacts at end of each process / discipline	
2.	**Software Architecture**	**4**
2.1	What Software Architecture is and what it isn't.	
2.2	Why is architecture important?	
2.3	Architectural structures and views	
	Architectural Styles	

	3.1	Architectural Styles	
	3.2	Pipes and Filters	
	3.3	Data Abstraction and Object – Oriented Organization	
	3.4	Event-Based, Implicit Invocation	
3.	**3.5**	Layered Systems	**6**
	3.6	Repositories	
	3.7	Interpreters	
	3.8	Other familiar Architectures	
	3.9	Heterogeneous Architectures.	
4.	**Introduction to Patterns**		**4**
	4.1	What is a Pattern & Design Pattern	
	4.2	What makes a Pattern (GOF)	
	4.3	Describing Design Patterns.	
	4.4	Pattern Categories & Relationships between Patterns.	
	4.5	Organizing the Catalogue.	
	4.6	Patterns and Software Architecture.	
5.	**Study of Design Patterns**		**12**
	5.1	Creational Patterns-singleton, factory method, abstract factory	
	5.2	Structural Patterns-adapter, decorator, facade	
	5.3	Behavioural Patterns-iterator, observer, strategy, command and state (study of intent, applicability, participants, structure, collaboration , Java Example code , Implementation and consequences)	
6.	**GRASP**(General Responsibility Assignment Software Patterns)		**10**
	6.1	Expert, Creator, High Cohesion, Low Coupling	
	6.2	Controller, Polymorphism, Pure Fabrication, Indirection	
	6.3	Don't Talk to Strangers	
7.	**Study of Frameworks**		**14**
	7.1	Frameworks as reusable chunks of architecture	
	7.2	The framework lifecycle, development using frameworks	
	7.3	Spring Core Framework	
	7.4	Spring Boot Framework	
	7.5	Microservices with Spring	
	7.6	Web Architectures: Google Web Tool Kit, Spring , Hibernate etc.	
	7.7	Selection of proper framework	
	7.8	Comparing Frameworks	
	7.9	Advantages of Spring	
	7.10	Web based Case Study	
8.	**Case Study (any one of the web Architecture)**		**8**
	8.1	Take a Framework and find Patterns in the Frame work.	
	8.2	Benefits of Patterns in the chosen Framework	

8.3 How Pattern interact in the selected Framework.

References:

1. Design Patterns – Elements of Reusable Object-oriented Software By E. Gamma, Richard Helm, Ralph Johnson , John Vlissides (GoF)
2. Pattern – Oriented Software Architecture (POSA) Volume 1. By : Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal.
3. Software Architecture in Practice. By Len Bass, Paul Clements, Rick Kazman
4. Applying UML and Patterns By Craig Larman.
5. Software Architecture- Perspectives on an emerging discipline by Mary shaw and David Garlan
6. Head First Design Pattern by Kathy Sierra, Bert Bates, Elisabeth Robson, Eric Freeman Publisher: O'Reilly Media, Inc.
7. Building Microservices-Designing Fine-Grained Systems By Sam Newman Publisher: O'Reilly Media
8. Design patterns in Java by Douglas Schmidt Publisher O'Reilly
9. Professional Java Development with the Spring Framework **1st Edition** by Rod Johnson, Alef Arendsen, Thomas Risberg, Colin Sampaleanu ; WROX publication
10. Mastering Spring 5: An effective guide to build enterprise applications using Java Spring and Spring Boot framework, 2nd Edition by Ranga Rao Karanam ; PACKT publishing

CSUT232 Machine Learning Total Credits - 4

Pre-requisites:

- Familiarity with Probability Theory, Multivariable Calculus, Linear Algebra
- Programming in Python (NumPy, SciPy, Pandas, Matplotlib, Seaborn, SciKit-Learn, StatsModel)

Course Objectives:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To write python programs using machine learning algorithms for solving practical problems.
- To understand about Machine Learning Library and use cases.
- To understand about the process of deploying ML model.

Course Outcomes:

- Recognize the characteristics of machine learning that make it useful to real-world problems.
- Process available data using python libraries and predict outcomes using Machine Learning algorithms to solve given problem.
- Able to estimate Machine Learning models efficiency using suitable metrics.
- Design application using machine learning techniques.

Chapter No.	Topics	# Lectures
1.	**Introduction to Machine Learning**	**7**
1.1	Data Science, Artificial Intelligence and Machine Learning	
1.2	Why Learn and What is Learning, What is Machine Learning Traditional Programming Vs. Machine Learning, Machine Learning Process, 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, Handling Missing Data, Splitting the dataset into the Training set and Test set, Feature Scaling	
2.	**Machine Learning Models**		**6**
	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, likelihood, posterior probability	
	2.5	Classification Accuracy and Performance	
3.	**Regression Models**		**10**
	3.1	Linear Regression - Simple , Multiple, Polynomial	
	3.2	Non-linear Regression – Decision Tree, Support Vector, Random Forest	
4.	**Classification Models**		**10**
	4.1	K – Nearest Neighbours (KNN)	
	4.2	Logistic Regression	
	4.3	Naive Bayes Theorem	
	4.4	Support Vector Machine	
	4.5	Decision Forest Classification	
	4.6	Random Tree Classification	
5.	**Clustering Models**		**7**
	5.1	K-means	
	5.2	Hierarchical Clustering (Agglomerative, Divisive), Dendrogram	
	5.3	Selecting optimal number of clusters: Within Clusters Sum of Squares (WCSS) by Elbow Method	
6.	**Association Rules**		**5**
	6.1	Key Terms: Support, Confidence and Lift	
	6.2	Apriori Algorithm	
7.	**Reinforcement Learning**		**7**
	7.1	Upper Confidence Bound	
	7.2	Thompson Sampling	
	7.3	Q-Learning	

8. Deep Learning **8**

8.1 Artificial Neural Network

8.2 Convolution Neural Network

8.3 Recurring Neural Network

References:

1. Mitchell, Tom M. "Machine learning. WCB." (1997).
2. Rogers, Simon, and Mark Girolami. *A first course in machine learning*. CRC Press, 2015.
3. Friedman, Jerome, Trevor Hastie, and Robert Tibshirani. *The elements of statistical learning*. Vol.1. Springer, Berlin: Springer series in statistics, 2001.
4. Witten, Ian H., and Eibe Frank. *Data Mining: Practical machine learning tools and techniques*. Morgan Kaufmann, 2005.
5. Machine learning course material by Andrew Ng, Stanford university
6. Sutton, Richard S., and Andrew G. Barto. *Reinforcement learning: An introduction*. Vol. 1. No. 1. Cambridge: MIT press, 1998.
7. Iba, Takashi, et al. "Learning patterns: A pattern language for active learners." *Conference on Pattern Languages of Programs (PLoP)*. 2009.

CSUT233- Web Frameworks Total Credits - 4

Pre-requisites

- Basic knowledge of Java Script.
- Basics of web application development.
- Knowledge of what is Clint and Server side programming.

Course Objectives:

- To introduce students for modern web technologies.
- To learn and use server side programming using Node.js
- To understand asynchronous programming.
- To learn and understand web application in Django a Python Web Framework.

Course Outcomes:

- Students will be ready with the technology which is used widely in Industry as a part of full stack developer.
- Students will know the powerful way to develop the web application in Python.
- Students will understand what really the asynchronous programming.
- Build and deploy robust Django Web App.
- Integrate with Restful web services.

Chapter No.	Topics	# Lectures
1.	**Java Script Basics**	4
	1.1 Java Script data types	
	1.2 Variables, Functions, Events, Regular Expressions	
	1.3 Array and Objects in Java Script	
	1.4 Java Script HTML DOM	
	1.5 Promises and Callbacks	
2.	**Introduction to Node JS**	3
	2.1 Introduction	
	2.2 What is Node JS and its advantages	

2.3 Traditional Web Server Model

2.4 Node JS Process model

2.5 Installation of Node JS

2.6 Node JS event loop

3. Node JS Modules **5**

3.1 Functions
3.2 Buffer
3.3 Module and Module Types
3.4 Core Module, Local Module
3.5 Directories as module
3.5 Module.exports

4. Node Package Manager **4**

4.1 What is NPM?
4.2 Installing package locally
4.3 Adding dependencies in package.json
4.4 Installing packages globally
4.5 Updating packages
4.6 Managing Dependencies

5. Web Server **3**

5.1 Creating Web Server
5.2 Handling HTTP requests
5.3 Sending Requests
5.4 HTTP Streaming

6. File System **4**

6.1 FS Model
6.2 Files and Directories
6.6 Streams
6.4 Reading and Writing Files
6.5 Reading and Writing Directories
6.6 Other File Operations

7. Events **6**

7.1 Asynchronous JS
7.2 Asynchronous control flow with callbacks
7.3 Promises
7.4 EventEmitter Class
7.5 ASync/Await
7.6 Returning Event Emitter
7.7 Inheriting Events

8.	**Working with Databases**	**6**
8.1	Connection String	
8.2	Configuring	
8.3	Working with Select command	
8.4	Various database operations	
8.5	MongoDB	
8.6	Mongoose ODM	
8.7	Mongoose Schema	
8.8	Mongoose Model	
8.9	Querying with Mongoose	
9.	**Express JS**	**7**
9.1	REST	
9.2	Introduction to Express JS	
9.3	Routing, Responding	
9.4	Configuration	
9.5	Views	
9.6	Receiving Data	
9.7	Error Handling	
10.	**Introduction to DJango**	**4**
10.1	What is DJango	
10.2	DJango and Python	
10.3	DJango MVT	
10.4	How to get and install DJango	
11.	**Getting Started with DJango**	**5**
11.1	About 3 core files : model.py, urls.py, views.py	
11.2	Setting up database connections (MySQL/SQLServer)	
11.3	Managing Users & DJango admin tools	
11.4	Installing and using 'Out of the Box' Django features	
12.	**DJango URL Patterns and Views**	**4**
12.1	Designing a good URL Schema	
12.2	Generic Views	
13.	**DJango Forms**	**5**
13.1	Form Classes	
13.2	Validations	
13.3	Authentication	
13.4	Advanced Form Processing Techniques	
14.1	DJango REST Framework	
14.2	DJango Piston	

References:

1. Node.js complete reference guid , velentin Bojinov, David Herron, Dioge Resende, packt Publishing Ltd
2. Mastering Nod.js By Sandro Pasquali , packt Publishing
3. Smashing Node.js, Java Script Everywhere , Guillermo Rauch, John wiley & Sons
4. Django for Beginners : Build websites with Python and Django Kindle Edition by William S Vincent
5. Two Scoops of Django 1.11 : Best Practices for the Django web Framework Book by Danial Roy Greenfeld and Audrey Roy Greenfeld
6. Web Development with Django CookBook by Aidas Bendoraits Second Edition PACKT Publishing

CSDT234A	Big Data Analytics	Total Credits – 2

Pre-requisites:

- Basic knowledge of Linux working and its commands.
- One must be able to install and uninstall its packages.
- Programming Languages - Programming Languages like Python, Scala, Java is required because it helps to understand Hadoop programming.

Course Objectives:

1. To understand the Big Data challenges & opportunities, its applications
2. Understanding of concepts of map and reduce and functional programming
3. Gain conceptual understanding of Hadoop Distributed File System.
4. To solve the case studies related to real life situations
5. To bridge the gap between academics and industry needs.

Course Outcomes:

- Recognize the characteristics, applications of big data that make it useful to real-world problems.
- Process available data using big data tools hadoop file system and predict outcomes to solve given problem.
- Study & Design various case studies using big data tools/commands and analyse it.

Chapter No.	Topics	# Lectures
1.	**Introduction to Big data**	
	1.1 Big Data :Definition & taxonomy	**5**
	1.2 Sources of Big Data	
	1.3 3V's of Big Data (need for Hadoop)	
	1.4 Varying data structures	
	1.5 Characteristics of Big Data	
	1.6 Applications of Big Data	
	1.7 Challenges in Big Data	
	1.8 **Big Data Implications for Industries** Big Data Analytics for Telecom/Banking/Retail/HealthCare/IT/Operations	

2.	**Emerging Database Landscape**	**3**
	2.1 Scale-Out Architecture, RDBMS Vs Non-Relational Database	
	2.2 Database Workload & its Characteristics	
	2.3 Implication of Big Data Scale on Data Processing	
3.	**Application Architecture & Data Modeling For Big Data And Analytics**	**5**
	3.1 Big Data Warehouse & Analytics	
	3.2 Big data Warehouse System requirements & Hybrid Architectures	
	3.3 Enterprise Data Platform Ecosystem	
	3.4 Big Data and Master Data Management	
	3.5 Understanding data integration Pattern	
	3.6 Big Data Workload Design Approaches	
	3.7 Map-Reduce patterns ,Algorithms and Use Cases	
4.	**The Hadoop Ecosystem**	**8**
	4.1 Introduction to Hadoop	
	4.2 Hadoop Architecture	
	4.3 History of Hadoop-Facebook,Dynamo,Yahoo,Google	
	4.4 Hadoop Components :HDFS, Mapreduce	
	4.5 Introduction to Pig,Hive ,HBase ,Mahout	
	4.6 Installation of single node cluster-installation of java Hadoop configuration	
5.	**Extracting Value From Big Data**	**4**
	5.1 Real Time Analytics	
	5.2 In-Memory Data Grid for real Time Analysis	
	5.3 Map reduce & Real Time Processing ,Use Cases	
6.	**Big Data Analytics Methodology**	**5**
	6.1 Big Data Analytics Methodology-Analyze & evaluate business cases	
	6.2 Develop Business Hypothesis –Analyze outcomes, Build & Prepare Data Sets ,Select & Build Analytical Model ,Design for Big Data scale .Build production ready system ,setting up the Big Data Analytics system ,Gathering data ,measure & monitor	

References:

1. Madhu Jagdeesh,Soumendra Mohanty,Harsha Srivatsa,"Big Data Imperatives: Enterprise Big Data Warehouse,BI Implementations and Analytics",1st Edition, Apress(2013)
2. Frank J.Ohlhorst,"Big Data Analytics:Turning Big Data into Big Money",Wiley Publishers(2012)
3. Cristian Molaro,Surekha Parekh,Terry Purcell,"DB2 11:The Database for Big Data & Analytics",MC Press,(2013)
4. Tom White,"Hadoop-The Definitive Guide,Storage and analysis at internet scale",SPD, O'Really.
5. DT Editorial Services,"Big Data, Black Book-Covers Hadoop2, MapReduce,Hive,YARN, Pig, R and Data Visualization" Dreamtech Press,(2015).
6. Big Data Case Study by Bernard Marr –Willey Publications.

CSDP234A Big Data Analytics Practical Total Credits – 2

NOTE:

It is expected to form teams and ask students to solve these case studies, discuss and work on solutions. (Refer Book No 6 for solving case studies. In-detail explanation for case studies below is given in the said book)

1. Assignment 1: Case study on Facebook
2. Assignment 2: Case Study on IoT Sensors
3. Assignment 3: Case Study on Telecom Industry
4. Assignment 4: Case Study on Banking
5. Assignment 5: Case study on Amazon
6. Assignment 6: Case Study on General Electric –By TCS
7. Assignment 7 : Case Study on Uber
8. Assignment 8: Case Study on Netflix
9. Assignment 9: CDC(Corona Virus and other Pandemics)

Practical's

Note: Slips should be designed on the basis of following topics at college level. The practical's should be taken on the basis of above case studies.

1. Navigating in Hadoop environment [Operational commands in Hadoop environment like moving, copying files. creating directories etc.
2. Understand HDFS
3. Using unix tools
4. Development in Hadoop environment , using various Hadoop tools/utilities
5. Develop mapReduce programs [Assignments] - Develop mapReduce functions either in Java or Python

CSDT234B- Web Analytics Total Credits: 2

Objectives:

1. Understand social media, web and social media analytics, and their potential impact.
2. Determine how to Leverage social media for better services and Understand usability metrics, web and social media metrics.
3. Use various data sources and collect data relating to the metrics and key performance indicators.
4. Identify key performance indicators for a given goal, identify data relating to the metrics and key performance indicators.

Chapter No.	Topics	# Lectures
1	**Introduction**	2
	1.1 What is web Analytics	
	1.2 Importance of web Analytics	
	1.3 Web Analytics process	
	1.4 Types of web analytics	
	1.5 Web analytics technical requirements	
	1.6 Web analytics 2.0 framework	
2	**Qualitative Analysis**	4
	2.1 Heuristic evaluations:	
	2.1.1Conducting a heuristic evaluation	
	2.1.2. Benefits of heuristic evaluations	
	2.2 Site Visits:	
	2.2.1. Conducting a site visit,	
	2.2.2. Benefits of site visits	
	2.3 Surveys:	
	2.3.1. Website surveys	
	2.3.2. Post-visit surveys	
	2.3.3. creating and running a survey	
	2.3.4. Benefits of surveys.	
3	**Web Metrics**	10
	3.1 Key metrics	
	3.2 3.2. Dashboard	
	3.2.1. Implementation	
	3.2.2. metrics	
	3.2.3. Types of metrics	
	3.3 Conversion	

3.3.1. goals,
3.3.2. funnels

3.4 Data sources
3.4.1. server log
3.4.2. visitors data
3.4.3. search engine statistics and conversion funnels

3.5 Data segmentation

3.6 Analysis

3.7 Emerging analytics
3.7.1. e commerce
3.7.2. mobile analytics
3.7.3. A/B testing

3.8 Social Media Analytics
3.8.1. Sentimental Analysis
3.8.2. Text Analysis

3.9 Annotation and Reporting
3.9.1. Automated
3.9.2. Actionable

4 Web Analytics 2.0 **7**

4.1 4.1 Introduction to analytic 2.0

4.2 Competitive intelligence analysis

4.3 CI data sources:
4.3.1. Toolbar data
4.3.2. Panel data
4.3.3. ISP data
4.3.4. Search engine data
4.3.5. Hybrid data

4.4 Website traffic analysis:
4.4.1. Comparing long term traffic trends
4.4.2 Analyzing competitive site overlap and opportunities.

5 Google Analytics: **7**

5.1 Audience analysis

5.2 Acquisition analysis

5.3 Behaviour analysis

5.4 Conversion analysis

5.5 Google website optimizer

5.6 Implementation technology

5.7 Privacy issues

References:

1. Clifton B., Advanced Web Metrics with Google Analytics, Wiley Publishing, Inc.2nd ed.
2. Kaushik A., Web Analytics 2.0, The Art of Online Accountability and Science of Customer Centricity, Wiley Publishing, Inc. 1st ed.
3. Kaushik A., Web Analytics: An Hour a Day, 1st ed.
4. Sterne J., Web Metrics: Proven methods for measuring web site success, John Wiley and Sons

CSDP234B Web Analytics Practical Total Credits – 2

1 **Mining Twitter: Exploring Trending Topics, Discovering What People Are Talking About, and More**
Why Is Twitter All the Rage?, Exploring Twitter's API, Fundamental Twitter Terminology, Creating a Twitter API Connection, Exploring Trending Topics, Searching for Tweets, Analysing the 140 Character, Extracting Tweet Entities, Analysing Tweets and Tweet Entities with Frequency Analysis, Computing the Lexical Diversity of Tweets, Examining Patterns in Retweets, Visualizing Frequency Data with Histograms

2 **Mining Facebook: Analysing Fan Pages, Examining Friendships, and More**
Overview, Exploring Facebook's Social Graph API, Understanding the Social Graph API, Understanding the Open Graph Protocol, Analysing Social Graph Connections, Analysing Facebook Pages, Examining Friendships

3 **Mobile Analytic: Analyse the your site on mobile device**
In last 30 days, how many new users come from mobile, What was the bounce rate of visitors on mobile device, What was the average session duration?

4 **Segment traffic:**
Which social channel is sending the most engaged new users, Which page of your Website have been shared most, Which URL has the best engagement matrix.

5 Use Google Analytics to measure the various metrics for E-commerce site amazon.
On-site – It measures the users' behaviour once it is on the website. For example, measurement of your website performance.
Off-site – It is the measurement and analysis irrespective of whether you own or maintain a website. For example, measurement of visibility, comments, potential audience, etc.

6 Use Google Analytics to measure the various metrics for E-commerce site flipkart
Count

It is most basic metric of measurement. It is represented as a whole number or a fraction. For example,

Number of visitors = 12999, Number of likes = 3060, etc.
Total sales of merchandise = $54,396.18.

Ratio
It is typically a count divided by some other count. For example, Page views per visit.

Key Performance Indicator (KPI)

It depends upon the business type and strategy. KPI varies from one business to another.

7 **Visitors loyalty:**

Analyse the person who visit site again and again is loyal to company because they can become customer

8 Consider the any E-Commerce site and to measure the web analytics.

Content

It gives you insight about website's content section. You can see how each page is doing, website loading speed, etc.

Page Load Time

More is the load time, the more is bounce rate. Tracking page load time is equally important.

Engagement Rate

It shows how long a person stays on your web page. What all pages he surf. To make your web pages more engaging, include informative content, visuals, fonts and bullets.

9 **Text Analytics:** Interpreting Twitter Data From college students Tweets. Extracting Tweet Entities, Analysing Tweets and Tweet Entities with Frequency Analysis, Computing the Lexical Diversity of Tweets, Examining Patterns in Retweets, Visualizing Frequency Data with Histograms

10 Consider the any E-Commerce site and to measure the web analytics.

Bounce Rate

If a person leaves your website within a span of 30 sec, it is considered as a bounce. The rate at which users spin back is called the bounce rate.

To minimize bounce rate include related posts, clear call-to-action and backlinks in your webpages.

Behavior

Behavior lets you know page views and time spent on website. You can find out how customer behaves once he is on your website.

CSDT234C: Project — Total Credits: 2

Teaching Scheme
- **Project: 2 hours/week**
- **Batch Size: 5 students**

Workload :

1. One project guide to be assigned to 5 students.
2. 2 hours /week to be allotted for 5 students

Guidelines:

- Students should work in a team of minimum 2 and maximum 3 students.
- Students can choose a project topic without any restriction on technology or domain.
- The student group will work independently throughout the project work including: problem identification, information searching, literature study, design and analysis, implementation, testing, and the final reporting.
- Project guide must conduct project presentations (minimum 2) to monitor the progress of the project groups.
- At the end of the project, the group should prepare a report which should conform to international academic standards. The report should follow the style in academic journals and books, with clear elements such as: abstract, background, aim, design and implementation, testing, conclusion and full references, Tables and figures should be numbered and referenced to in the report.
- The final project presentation with demonstration (UE) will be evaluated by the project guide (appointed by the college) and one external examiner (appointed by the University).

Evaluation guidelines:

IA (15 marks)			**UE (35 marks)**		
First presentation	Second presentation	Documentation	Project Logic/Presentation	Documentation	Viva
5	5	5	20	5	10

Recommended Documentation contents:

Abstract
Introduction
-motivation
-problem statement
-purpose/objective and goals
-literature survey
-project scope and limitations

System analysis

-Existing systems

- scope and limitations of existing systems

-project perspective, features

- stakeholders

-Requirement analysis - Functional requirements, performance requirements, security requirements etc.

System Design

- Design constraints

- System Model: UML diagrams

- Data Model

-User interfaces

Implementation details

-Software/hardware specifications

Outputs and Reports

Testing

Test Plan, Black Box Testing or Data Validation Test Cases, White Box Testing or Functional Validation Test cases and results

Conclusion and Recommendations

Future Scope

Bibliography and References

CSDP234C: Project Related Assignments Total Credits: 2

Teaching Scheme

- **2 lectures/week**

Workload :

- 2 lectures/week

Guidelines:

- The project assignments are a compulsory part of the project course and should be carried out by each project group.
- Project assignments are to be given by the guide for continuous internal evaluation.
- The project assignments are to be allotted to each group separately by the project guide on the basis of the implementation technology. A suggested list of assignments is given below.
  1. Project Time management: plan (schedule table), Gantt chart, Roles and responsibilities, data collection, Implementation
  2. Simple assignments to evaluate choice of technology
  3. Assignments on UI elements in chosen technology
  4. Assignments on User interfaces in the project
  5. Assignments on event handling in chosen technology
  6. Assignments on Data handling in chosen technology
  7. Online and offline connectivity
  8. Report generation
  9. Deployment considerations
  10. Test cases
- Each student within the group must work actively and contribute to the assignments, project work and report writing.

Evaluation guidelines:

IA (15 marks)		**UE (35 marks)**	
Attendance	Assignments	Assignments	Viva
5	10	25	10

CSUP235 Practical on CSUT231, CSUT232 and CSUT233 Total Credits – 4

Teaching Scheme:

- 8 hours/week
- 10 Students/Batch

Pre-requisites:

- Programming in Java
- Programming in Python
- Programming in Nodejs

Course Objectives:

- To write java programs using Design Pattern and Frameworks to create reusable and flexible software systems.
- To understand about the process of deploying web apps using specific Frameworks.
- To write python programs using machine learning algorithms for solving practical problems.
- To understand about the process of deploying ML model.

Course Outcomes:

- Able to use specific frameworks as per applications need.
- Design java application using design pattern techniques.
- Process available data using python libraries and predict outcomes using Machine Learning algorithms to solve given problem.
- Able to estimate Machine Learning models efficiency using suitable metrics.

Software Architecture & Design Pattern List of Assignments	# Practical's
1. Write a JAVA Program to implement built-in support (java.util.Observable) Weather station with members temperature, humidity, pressure and methods mesurmentsChanged(), setMesurment(), getTemperature(), getHumidity(), getPressure() Book 6: (Page No.-67)	
2. Write a Java Program to implement I/O Decorator for converting uppercase letters to lower case letters. Book 6: (Page No.-102)	
3. Write a Java Program to implement Factory method for Pizza Store with createPizza(), orederPizza(), prepare(), Bake(), cut(), box(). Use this to create variety of pizza's like NyStyleCheesePizza, ChicagoStyleCheesePizza etc. Book 6:(Page No.-125-130)	
4. Write a Java Program to implement Singleton pattern for multithreading. Book 6:(Page No.-180)	

5. Write a Java Program to implement command pattern to test Remote Control. Book 6: (Page No.-210)
6. Write a Java Program to implement undo command to test Ceiling fan. Book 6:(Page No.-222)
7. Write a Java Program to implement Adapter pattern for Enumeration iterator. Book 6: (Page No.-250)
8. Write a Java Program to implement Iterator Pattern for Designing Menu like Breakfast, Lunch or Dinner Menu. Book 6 (page no 326)
9. Write a Java Program to implement State Pattern for Gumball Machine. Create instance variable that holds current state from there, we just need to handle all actions, behaviors and state transition that can happen. For actions we need to implement methods to insert a quarter, remove a quarter, turning the crank and display gumball. Book 6: (page no 390/391)
10. Write a java program to implement Adapter pattern to design Heart Model to Beat Model. Book 6: (page no 546/547)
11. Design simple HR Application using Spring Framework Book 9

Machine Learning Practical's	**# Practicals**

1. Write a python program to Prepare Scatter Plot (Use Forge Dataset / Iris Dataset)
2. Write a python program to find all null values in a given data set and remove them.
3. Write a python program the Categorical values in numeric format for a given dataset.
4. Write a python program to implement simple Linear Regression for predicting house price.
5. Write a python program to implement multiple Linear Regression for a given dataset.
6. Write a python program to implement Polynomial Regression for given dataset.
7. Write a python program to Implement Naïve Bayes.
8. Write a python program to Implement Decision Tree whether or not to play tennis.
9. Write a python program to implement linear SVM.
10. Write a python program to find Decision boundary by using a neural network with 10 hidden units on two moons dataset
11. Write a python program to transform data with Principal Component Analysis (PCA)
12. Write a python program to implement k-nearest Neighbors ML algorithm to build prediction model (Use Forge Dataset)
13. Write a python program to implement k-means algorithm on a synthetic dataset.
14. Write a python program to implement *Agglomerative clustering* on a synthetic dataset.

Data Sets for ML

- **UCI Machine Learning Repository**
- **www.kaggle.com**

Note : Install node js and visual studio editor on your machine

1. Create an HTML form that contain the Student Registration details and write a JavaScript to validate Student first and last name as it should not contain other than alphabets and age should be between 18 to 50.
2. Create an HTML form that contain the Employee Registration details and write a JavaScript to validate DOB, Joining Date, and Salary.
3. Create an HTML form for Login and write a JavaScript to validate email ID using Regular Expression.
4. Create a Node.js file that will convert the output "Hello World!" into upper-case letters:
5. Using nodejs create a web page to read two file names from user and append contents of first file into second file
6. Create a Node.js file that opens the requested file and returns the content to the client. If anything goes wrong, throw a 404 error
7. Create a Node.js file that writes an HTML form, with an upload field
8. Create a Node.js file that demonstrate create database and table in MySQL
9. Create a node.js file that Select all records from the "customers" table, and display the result object on console
10. Create a node.js file that Insert Multiple Records in "student" table, and display the result object on console
11. Create a node.js file that Select all records from the "customers" table, and delete the specified record.
12. Create a Simple Web Server using node js
13. Using node js create a User Login System
14. Using node js create a eLearning System
15. Using node js create a Recipe Book
16. write node js script to interact with the filesystem, and serve a web page from a file
17. Write node js script to build Your Own Node.js Module. Use require ('http') module is a built-in Node module that invokes the functionality of the HTTP library to create a local server. Also use the export statement to make functions in your module available externally. Create a new text file to contain the functions in your module called, "modules.js" and add this function to return today's date and time.
18. Create a js file named main.js for event-driven application. There should be a main loop that listens for events, and then triggers a callback function when one of those events is detected.

19. Write node js application that transfer a file as an attachment on web and enables browser to prompt the user to download file using express js.
20. Create your Django app in which after running the server, you should see on the browser, the text "*Hello! I am learning Django*", which you defined in the index view.
21. Design a Django application that adds web pages with views and templates.
22. Write and run Django code to add data to your site using relational databases with Django's Object Relational Mapper.
23. Develop a basic poll application (app).It should consist of two parts:
    a) A public site in which user can pick their favourite programming language and vote.
    b) An admin site that lets you add, change and delete programming languages.
24. A public site in which user can pick their favourite programming language and vote.
25. An admin site that lets you add, change and delete programming languages.
26. Implement a simple Django application for portfolio management.
27. Create your own blog using Django
28. Build your own To-Do app in Django
29. Create a clone of the "*Hacker News*" website.
30. Develop Online School System using Django
31. Implement your E-commerce Website using Django
32. Implement Login System using Django

M.Sc. Sem IV

CSUIT241 : Industrial Training /Institutional project Total Credits : 20

Teaching Scheme:
2 hours/week

The Industrial Training /Institutional project is equivalent to 5 theory courses of 4 credits each. Marks per 4 credits = 100. The total weightage for Industrial/Institutional training is 500 marks.

Workload :

1. One mentor to be assigned for 5 students.
2. 2 hours /week to be allotted for 5 students

Guidelines:

- Each student must individually complete **minimum 5 months** full time Industrial training / Institutional project in the 4th semester.
- College should assign a student mentor to every student. The mentor will monitor the progress of the student throughout the semester for continuous assessment.
- Student should submit a valid offer letter and synopsis within two weeks of starting the internship.
- There will be continuous assessment of the work done by the student during the internship period.
- Continuous assessment guidelines:
  1. Student should submit a weekly report in the college to the mentor.
  2. The report should contain the following details: Name of student, project title, company name, company mentor, daily activities and results/output, proposed work for next week.
  3. The weekly report should be duly signed by the student and company mentor/ institute guide (CM).
  4. Student Mentor should maintain weekly attendance record for every student.
  5. Two presentations should be conducted for each student (first presentation after first month and second presentation after 3rd month)
  6. Student Mentor should take feedback from the Company mentor regarding overall performance of the student.
- At the end of the internship period, each student should prepare a report which should conform to international academic standards.

- The report should follow the style in academic journals and books, with contents such as: abstract, background, aim, design and implementation, testing, conclusion and full references, Tables and figures should be numbered and referenced to in the report.

Examination and Evaluation guidelines

- The project done during internship period will be evaluated in the following manner: **IA - 150 marks + UE-350 marks.**
- The final presentation and documentation will be evaluated by three examiners:
    1. Student mentor (appointed by respective college)
    2. External examiner (appointed by the University)
    3. IT expert (appointed by respective college)

IA (150 marks)				
Weekly Attendance	Weekly Reports	First Presentation	Second Presentation	Documentation
20	40	20	40	30

UE (350 marks)		
Mentor	IT Expert	External Examiner
100	125	125

Recommended Documentation contents:

Title page
Company / Institute certificate
Internship completion certificate
Abstract
Introduction
-motivation
-problem statement
-purpose/objective and goals
-literature survey
-project scope and limitations
System analysis
-Comparative study of Existing systems
- scope and limitations of existing systems
-project perspective, features
- stakeholders
-Requirement analysis - Functional requirements, performance requirements, security requirements etc.
System Design
- Design constraints
- System Model: UML diagrams
- Data Model

-User interfaces

Implementation details

-Software/hardware specifications, etc.

Reports

Testing

Test Plan, Black Box Testing or Data Validation Test Cases, White Box Testing or Functional Validation Test cases and results

Conclusion and Recommendations

Future Scope

Bibliography and References