West Bengal State Council of Technical &
Vocational Education and Skill
Development
(Technical Education Division)

Syllabus
of

Diploma in Computer Science & Engineering [CSE], Computer Science & Engineering [CST], Computer Software Technology [CSWT] & Information Technology [IT]

Part-III (6th Semester)

2023

				Hours per			Total contact hrs/ week	Credits
Sl. No	Category	Code No.	Course Title	L	T	P		
1.	Program Elective course-4	COPE307/ ***	Program Elective-4 (any one) i) Data Sciences: Data Warehousing & Data Mining, ii) Cloud Computing.	3	1	0	4	4
2.	Humanities and Social Science course	HS302	Entrepreneurship and Start-ups			0	3	3
3.	Open Elective-1	OE301/***	Open Elective-1 (Any one) i)Engineering Economics and Project Management	2 3	1 0	 0	3	3
4.	Open Elective-2	OE302/***	Open Elective-2 (any one) i) Machine Learning ii) Web Designing	3	0	0	3	3
5.	Major Project	PR302		0	0	6	6	5^
6.	Seminar	SE302		1	0	0	1	1
			Total Credits					19

*** Will be mentioned by the subject name.
^2 credit is carried forward from the Vth semester major project evaluation.

Total Credit Point = 82 (Sem 3,4,5,6)

Course Title: Data Warehousing & Data Mining	
Course Code	**COPC207**
Number of Credits: 4 - L:3,T:1,P:0	
Prerequisites	**NIL**
Course Category	PC
Course code: CST	**Semester: Sixth**
Duration: 15 weeks	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 4 hrs./week Total Contact Hours: 60 Hours	Continuous Internal Assessment: 20 Marks Attendance: 10 Marks Viva/Presentation/Assignment/Quiz etc.: 10 Marks End Semester Examination: 60 Marks
Aim of the Course	

This course will introduce the concepts of data ware house and data mining, which gives a complete description about the principles, used, architectures, applications, design and implementation of data mining and data ware housing concepts.

Course Objectives

To introduce the student to various data warehousing and data mining techniques. The course will cover all the issues of KDD process and will illustrate the whole process by examples of practical applications.

   To make the student capable of applying data mining techniques in real time applications.

To make the student capable to compare and contrast different conceptions of data mining as evidenced in both research and application.

   Explain the role of finding associations in commercial market basket data.

   Identify and characterize sources of noise, redundancy, and outliers in presented data.

   To get an idea about the data that how it is going to be classified into clusters.

Course Content:		
Contents (Theory)	**Hrs./Unit**	**Marks**
UNIT 1: DATA WAREHOUSE	15	14

1.1 What Is a Data Warehouse? The need for a Separate Data Warehouse.
1.2 Data Warehouse Models: Enterprise Warehouse, Data Mart and Virtual Warehouse;
1.3 Differences between Operational Database Systems and Data Warehouses, Data Warehouse Modeling: Data Cube, Conceptual Modeling of Data Warehouse.
1.4 Concept Hierarchies, Measures: Their Categorization and Computation.
1.5 OLAP Operations, Operations in the Multidimensional Data Model (OLEP).
1.6 Data Warehouse Design and Usage, From Online Analytical Processing to Multidimensional Data Mining. Data Warehouse Implementation.

UNIT 2: INTRODUCTION TO DATA MINING	10	12

2.1 What is Data Mining? Process of Knowledge Discovery.
2.2 Types of Repositories, Data Mining Functionalities, Methods of presenting Derived Model.
2.3 Data Mining Tasks, Data Mining Trends, Data Mining Issues.

UNIT 3: ASSOCIATION AND CORRELATION ANALYSIS	8	8

3.1 Basic Concepts, how does Association Rule Learning work?
3.2 The Apriori Algorithm: Basics
3.3 FP Growth Algorithm, Applications of Association Rule Learning.

UNIT 4: CLUSTERING ALGORITHMS AND CLUSTER ANALYSIS	10	10

4.1 Unsupervised Learning basic idea.
4.2 Clustering Algorithms: K-Means Clustering, K-Medoids clustering (PAM), Hierarchical Clustering, Graph-Based Clustering.
4.3 Cluster Analysis basics, Cluster Evaluation
4.4 Outlier Detection and Analysis

UNIT 5: CLASSIFICATION	10	8

5.1 Supervised Learning: Classification, Issues regarding Classification, Types of Classifiers: Binary Classification, Multiclass Classification.
5.2 Classification Approaches: Bayesian Classification-Naïve Bayes, Association based Classification, Rule-Based Classifier.

UNIT 6: WEB MINING	7	8

6.1 Web Mining, Mining the web page layout structure.
6.2 Mining web link structure, mining multimedia data on the web.
6.3 Automatic classification of web documents and web usage mining.
6.4 Distributed Data Mining.

Course outcomes

Student should be able to

Sl. No.	Description	Bloom's Taxonomy Level
1	**Understand** the functionality of the various data mining and data warehousing component	**Knowledge, Understand**
2	**Appreciate** the strengths and limitations of various data mining and data warehousing models	**Apply, Create**
3	**Explain** the analyzing techniques of various data	**Analyze**
4	**Describe** different methodologies used in data mining and data ware housing.	**Analyze**
5	**Compare** different approaches of data warehousing and data mining with various technologies.	**Evaluating**

Reference Books:

Name of Authors	Title of the Book	Edition	Name of the publisher
Arun K Pujari	Data Mining Techniques	3rd Edition	University Press
David Hand, Heikki Mannila, Padhraic Smyth,	Principles of Data Mining	2012Reprint, Eastern Economy edition	PHI Learning Private Limited
Jiawei Han and Micheline Kamber	Data Mining-Concepts and Techniques	Second Edition	Kaufmann Publishers
Vikaram Pudi, P Radha Krishna	Data Mining	2009	Oxford University Press
Pang-Ning Tan & Michael Steinbach & Vipin Kumar	Introduction to Data Mining,	2nd Edition	Pearson Education

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Course Title :	**CLOUD COMPUTING**

Course Code	COPE307/2
Number of Credits :4	4 (L: 3, T: 1, P: 0)
Prerequisites	Netwoking Concepts
Course Category	PC
Course code : CST	Semester : SIXTH
Duration : 15 weeks	Maximum Marks : 100
Teaching Scheme	Examination Scheme
Theory : - 4 hrs/week	Continuous Internal Assessment : 20 Marks
Lectures:-3hrs/week **Tutorial: 1 hr/week**	Attendance-10 Marks
Total Contact Hours:60 Hours	Viva/Presentation/Assignment /Quiz etc : - 10 Marks
Practical : NIL	End Semester Examination : 60 Marks

Aim:	**It will provide the students basic understanding about Cloud Computing, virtualization along with its security aspects and how one can migrate over it.**

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Course Objectives:

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To learn the fundamental ideas behind Cloud Computing, the evolution of the paradigm, its applicability; benefits, as well as current and future challenges.
To understand the basics of cloud delivery models.
To learn about different virtualization techniques that serve in offering software, computation and storage services on the cloud.
 To Analyze the Strategies for Secure Operation the cloud and list of the security requirements
To comprehend the basic ideas of different cloud tools and applications.

Course Content:

Contents (Theory)	Hrs	Marks	Module
UNIT 1: Cloud Computing Fundamentals	**11**	11	**A**
Origins of Cloud computing. Fundamental concepts and models, Roles and boundaries. **Cloud components.** **On-demand self-service, Broad network access, Location independent resource pooling, Rapid elasticity, Measured service.** **Comparing cloud providers with traditional IT service providers, Roots of cloud computing** **Migrating to clouds.**			
UNIT 2: Cloud Delivery Model	**11**	**11**	**A**

Cloud Delivery Models, The SPI Framework.
Cloud Service Models.
Cloud Deployment Models.
Alternative Deployment models
 Expected benefits of the models.

UNIT 3: Virtualization	12	12	B
Characteristics & Taxonomy of virtualization.			

Virtualization vs Private Cloud.
Desktop Virtualization, Hardware Virtual Machine (HVM).
Virtual Servers.
Logical Network Perimeter, Network Virtualization
Data Center virtualization, Cloud Storage Device, Cloud usage monitor, Resource replication.

UNIT 4: Fundamental Cloud Security	14	14	B
Cloud Information Security Objectives.			

Cloud Security Services & Relevant Cloud Security Design Principles
 Secure Cloud Software Requirements.
Secure Development practices, Approaches to Cloud Software Requirement Engineering.
Privacy and Compliance Risks, Threats to Infrastructure,
Data and Access Control, Cloud Service Provider Risks.
Cloud Security Policy Implementation.

UNIT 5: Cloud Tools and applications	12	12	C

Cloud Performance Monitoring tools
 General model for Application platform
Apache Virtual Computing Lab, VMWare, CloudSim.
Microsoft Cloud Services (-Azure), Google Cloud Applications, Amazon cloud services.

Reference Books

"Cloud Computing Concepts, Technology & Architecture"- Thomas Erl, Zaigham Mahmood, and Ricardo Puttini , PrenticeHall
"Cloud computing a practical approach" - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill
"Cloud Computing (Principles and Paradigms)"- Rajkumar Buyya, James Broberg, Andrzej Goscinski, John, Wiley & Sons
"Cloud Computing"-Shailendra Singh, Oxford
"Cloud Computing-A Practical approach for learning and Implementation"-A Srinivasan & J. Suresh, Pearson

Course outcomes:

Analyze the Cloud computing setup with its vulnerabilities and applications using different architectures o Apply and design suitable Virtualization concept, Cloud Resource Management
o Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application
o Can understand the basics of security service models.
o Analyze the Strategies for Secure Operation the cloud architecture and list the security requirements.

Unit No.	Unit Title	Group	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Cloud Computing Fundamentals	A	4	4	3	11

2.	Cloud Delivery Model	A	4	4	3	11
3.	Virtualization	B	4	4	4	12
4.	Fundamental Cloud Security	B	4	4	6	14
5.	Cloud Tools and applications	C	4	4	4	12
	Total		**20**	**20**	**20**	**60**

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Course Title: Machine Learning	

Course Code	**OE302**
Number of Credits: 3 - L:3,T:0,P:0	
Prerequisites	Concept of AI
Course Category	PC
Course code: CST	**Semester: Sixth**
Duration: 15 weeks	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week Total Contact Hours: 45 Hours	Continuous Internal Assessment: 20 Marks Attendance: 10 Marks Viva/Presentation/Assignment/Quiz etc.: 10 Marks End Semester Examination: 60 Marks
Aim of the Course	

This course will introduce the concept of Machine Learning through different learning methods.

Course Objectives

To learn the concept of how to learn patterns and concepts from data without being explicitly programmed

To design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.

Explore supervised and unsupervised learning paradigms of machine learning.

To explore Neural Network and Genetic Algorithm.

Course Content:		
Contents (Theory)	**Hrs./Unit**	**Marks**
Unit 1: Supervised Learning (Regression & Classification)	15	20
Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes Linear models: Linear Regression, Logistic Regression, Generalized Linear Models Introduction to Support Vector Machines, Nonlinearity and Kernel Methods		
Unit 2: Unsupervised Learning	7	10
Clustering: K-means/Kernel K-means Dimensionality Reduction: PCA and kernel PCA Matrix Factorization and Matrix Completion		

UNIT 3: Artificial Neural Network	8	10

Neural network representation
Perception
Multilayer Network and Back Propagation Algorithm
Illustrative Example: Face recognition

UNIT 4: Genetic Algorithm	8	10

Representing Hypotheses
Genetic Operators
Fitness Function and Selection
Hypothesis space search
Genetic Programming

UNIT 5: Reinforcement Learning	7	10

Introduction
The Learning Task
Q Learning
Temporal Difference Learning

Note: Implementation of Machine Learning Algorithm by using suitable software can be done in Project work. Also seminar can be presented on topics of this subject.

Course outcomes

Student should be able to

Sl. No.	Description	Bloom's Taxonomy Level
1	Understand the concept of machine learning.	**Knowledge, Understand**
2	Identify the regression and classification problem.	Analyze
3	Relate the supervised, unsupervised learning in the real life problem.	**Analyze**
4	Evaluate the machine learning models with respect to the performance parameters.	**Analyze**
5	Design and implement various machine learning algorithms in the range of real world problems.	**Design**

Reference Books:

Name of Authors	Title of the Book	Edition	Name of the publisher
Tom M. Mitchell	Machine Learning	-	Mc Graw Hill
Christopher Bishop	Pattern Recognition and Machine Learning	-	Springer
Rajiv Chopra	Machine Learning	-	Khanna Publishing House
Christopher M.	Pattern Recognition	-	Springer

Bishop	and Machine		

	Learning		

Course Title: Web Designing

Course Code	OE302/2
Number of Credits: 3 - L:3,T:0,P:0	
Prerequisites	**NIL**
Course Category	PC
Course code: CST	**Semester: Sixth**
Duration: 15 weeks	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week Total Contact Hours: 45 Hours	Continuous Internal Assessment: 20 Marks Attendance: 10 Marks Viva/Presentation/Assignment/Quiz etc.: 10 Marks End Semester Examination: 60 Marks

Aim of the Course

This course will introduce the concepts of PHP frameworks, which gives a complete description about the principles, used, architectures, applications, design and implementation of web development concepts. After the completion of course, students will get hands on experience on various techniques of web development and will be able to design and develop a complete website.

Course Objectives

The objective of this course is to provide the necessary knowledge to design and develop dynamic, database-driven web applications using PHP version 5. Students will learn how to connect to any ODBC-compliant database, and perform hands on practice with a MySQL database to create database-driven HTML forms and reports etc. Students also learn how to configure PHP and Apache Web Server. Comprehensive lab exercises provide facilitated hands on practice crucial to develop competence web sites.

Course Content:

Contents (Theory)	Hrs./Unit	Marks	Module
UNIT 1:	7	12	A
Overview of PHP Static vs. Dynamic Web Sites Dynamic Content from Databases Developing Dynamic Internet Applications Client-Side Scripting vs. Server-Side Scripting Overview of PHP Advantages and Capabilities Configuring PHP.INI PHP vs. ASP Basic PHP echo and print Statements Comments in PHP PHP Case Sensitivity Defining variable and constant PHP Data Types PHP Operators			

Looping Constructs - while, do...while, for, for each

UNIT 2:		5	10	A

Introduction to the Apache Web Server - What is Apache? - The main benefits / advantages

Apache Installation - Apache Virtual Host - Name-based Virtual Hosts - IP-based Virtual Hosts
PHP Functions - Introduction to Functions - User Defined Functions - Passing Arguments to Functions - Variable scope - Local and Global Scope - Passing Arguments by Reference
Returning Values from a Function - Using Include Files - The Require Statement - Dynamic Function Calls - Recursive Functions - Predefined PHP Functions
PHP Arrays - What is an Array? - Why do we use arrays? - Indexed Arrays - Associative Arrays - Multidimensional Arrays - Sorting Arrays in PHP - Array Functions
PHP MySQL Database and Forms

UNIT 3:		10	10	B

What is MySQL? - Queries - PHP's Database APIs - Configuring PHP for Database Support - MySQL vs. Access - MySQL vs. SQL Server - Forms and Program - Insert Data Into - Insert Multiple Records Into MySQL - HTTP GET, POST, And Request methods - Insert Data From a Form Into a Database - PHP MySQL Select (Retrieving Data from Forms) - PHP MySQL The Where Clause - PHP MySQL Order By Keyword - PHP MySQL Update - PHP MySQL Delete - Looping through database - PHP Functions Specific to MySQL
Using Cookies with PHP - What is a Cookie? - How to Create a Cookie? - How to Retrieve a Cookie Value? - How to Delete a Cookie?
PHP Sessions - What is a PHP Session - Starting a PHP Session - Storing and Retrieve Session Variable - Session Unset - Destroy A PHP Session
Miscellaneous PHP Tasks - Error Logging - Using Environment Variables - PHP Redirect To Another URL - Getting IP Addresses from Visitors - PHP - Function preg_match()

UNIT 4:		6	8	B

PHP File Handling - String Functions

E-Commerce Site - What is E-Commerce - E-commerce platforms on the market
SQL Injection - Introduction
PDO - Introduction
Introduction to Frameworks
Introduction to CMS (Content Management System) - WordPress
AJAX
Introduction to open Source CMF (Content management framework) - Codeigniter

UNIT 5:		17	20	C

Introduction to Codeigniter - What is a PHP Framework - MVC Pattern - Why Should we use a PHP Framework? - When to use a PHP Framework? - What are the Best PHP Frameworks Available? - Codeigniter Overview - CodeIgniter Features - CodeIgniter Basic Concepts and Application Architecture - Installing Codeigniter - Basic Configuration Options - Database Configuration - CodeIgniter - Application Architecture - Directory Structure - CodeIgniter - MVC Framework - Application URL Structure

Controller Introduction - Calling a Controller - Creating & Calling Constructor Method - Controller function - Interacting with views

Views - Views- Introduction - Loading the View - Working with configuration layout - Creating custom layout - Controller variables and parameters - CodeIgniter URLs - Passing argument through url - Redirection - Form and Getting post data

Models - Model Introduction - Creating Model Class - User defined function in model - Connecting to a Database - Automatic Connecting - Manual Connecting - Inserting Data to Database - Fetching data - Deleting data - Updating data

Helpers - Helpers – Introduction - Array Helper, Cookie Helper, Date Helper, URL Helper, etc.. - Loading a Helper - Auto load Configuration

Session Management - Initializing a Session - Add Session Data - To retrieve all session data - To remove all session data - Flashdata - Retrieve Flashdata

Cookie Management

Course outcomes

Student should be able to

Sl. No.	Description	Bloom's Taxonomy Level
1	**Understand** the functionality of the various PHP syntax	**Knowledge, Understand**
2	**Appreciate** the strengths and limitations of PHP Frame Work	**Apply, Create**
3	**Explain** the analyzing techniques of CodeIgniter	**Analyze**
4	**Describe** different methodologies used in web Designing.	**Analyze**
5	**Compare** different approaches of web designing with various technologies. Develop different type of Web Application in 6th Semester Project work.	**Evaluating**

Note: Development of Web-page can be done as Project work. Also seminar can be presented on topics of this subject.

Reference Books:

Name of Authors	Title of the Book	Edition	Name of the publisher
Ullman	PHP for the Web: Visual Quick-Start Guide	5th Edition	Pearson
Thomas Myer	Professional CodeIgniter		John Wiley & Sons
Welling	PHP and MySQL Web Development	5th Edition	Pearson
Robin Nixon	Learning Php, MySQL & JavaScript: A Step-By-Step Guide to Creating Dynamic Websites	Second 6th Edition	SPD
Ray Harris	Murach's PHP & MySQL		SPD
Michael Morrison, Lynn Beighley	Head First PHP & MySQL		SPD

	A Brain-Friendly Guide		
Dr. Poornima G. Naik, Dr. Girish R. Naik	PHP Coding with CodeIgniter - Hands-on Experience with CodeIgniter		Educreation Publishing

Unit No.	Unit Title	Group	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Unit 1	A	4	6	2	12
2.	Unit 2	A	4	4	2	10
3.	Unit 3	B	4	2	4	10
4.	Unit 4	B	4	2	2	8
5.	Unit 5	C	4	6	10	20
	Total		20	20	20	60

Legends: R = Remember; U = Understand; A = Apply and above levels(Bloom's revised taxonomy)

<table>
<tr><td colspan="2" align="center">Course Title: Major Project</td></tr>
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Course Code	PR302
Number of Credits: 5	
Prerequisites	**NIL**
Course Category	PC
Course code: CST	**Semester: Sixth**
Duration: 15 weeks	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**

Theory: 6hrs./week Total Contact Hours: 90 Hours	Marks: 100
Aim of the Course	

Student should able to present their Project work or any other advanced topic. (AI, Cloud computing, Data Mining etc.)

Course Objectives

To make them understand the concepts of Project Management for planning to execution of projects.

To make them understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation.

To enable them to comprehend the fundamentals of Contract Administration, Costing and Budgeting.

Make them capable to analyze, apply and appreciate contemporary project management tools and methodologies in Indian context.

Course Content:

This project work is a continuation of 5th Semester Project that can be done individually or in group on topic as described in 5th Semester syllabus.

1.Understand project characteristics and various stages of a project.
   Understand the conceptual clarity about project organization and feasibility analyses
– Market, Technical, Financial and Economic.
Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.

Course Title: SEMINAR

Course Code	SE302
Number of Credits: 1	
Prerequisites	**NIL**
Course Category	PC
Course code: CST	**Semester: Sixth**
Duration: 15 weeks	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**

Theory: 1 hrs./week Total Contact Hours: 15 Hours	Marks: 100
Aim of the Course	

Student should able to present their Project work or any other advanced topic. (AI, Cloud computing, Data Mining etc.)

Course Objectives

Identify and compare technical and practical issues related to the area of course specialization.

Outline annotated bibliography of research demonstrating scholarly skills.

Prepare a well-organized report employing elements of technical writing and critical thinking.

Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.

Course Content:

Presentation can be done individually or in group
Presentation can be done on Project work
Presentation can be done on any advanced topic or emerging fields.
There should be sufficient number of slides.
Each student must present their presentation for at least 10 minutes.
Questions of audience must be answered.

CO1 - Establish motivation for any topic of interest and develop a thought process for technical presentation.
CO2 - Organize a detailed literature survey and build a document with respect to technical publications.
CO3 - Analysis and comprehension of proof-of-concept and related data.
CO4 - Effective presentation and improve soft skills.