SHIVAJI UNIVERSITY

KOLHAPUR

REVISED SYLLABUS AND STRUCTURE

FINAL YEAR (FINAL YEAR B. Tech) BACHELOR OF TECHNOLOGY

IN

Computer Science and Engineering (Data Science)

To be introduced from the academic year 2023-24 (w.e.f. July 2023) onwards

FINAL YEAR COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE) - CBCS PATTERN

SEMESTER – VII

Sr. No.	Course Subject / Title	TEACHING SCHEME							EXAMINATION SCHEME							
		THEORY			TUTORIAL		PRACTICAL		THEORY				ORAL / PRACTICAL		TERMWORK	
		Credits	N0. Of Lectures	Hours	Credits	No. of Hours	Credits	No. of Hours	mode	marks	Total Marks	MIN.	MAX	MIN.	MAX	MIN.
1	PCC-DS701 Artificial Intelligence	4	4	4	1	1			CIE	30	100	40			25	10
									ESE	70						
2	PCC- DS702 R Programming	3	3	3			1	2	CIE	30	100	40			25	10
									ESE	70						
3	PCC- DS703 Advanced Database Systems	3	3	3			1	2	CIE	30	100	40	50	20	25	10
									ESE	70						
4	PCE- DS704 Elective-I Information Retrieval System PCE- DS705 Elective-I Blockchain Technologies PCE- DS706 Elective-I Natural Language Processing	3	3	3	1	1			CIE	30	100	40			25	10
									ESE	70						
5	PCC- DS707 Deep Learning	3	3	3			1	2					50	20	50	20
6	PW- DS708 Project – I						2	4					50	20	50	20
7	SI-DS709 Internship						2								50	20
	Total (SEM –VII)	16	16	16	2	2	7	12			400		150		250	

FINAL YEAR COMPUTER SCIENCE AND ENGINEERING - CBCS PATTERN																
SEMESTER – VIII																
		TEACHING SCHEME						EXAMINATION SCHEME								
		THEORY			TUTORIAL		PRACTICAL		THEORY				ORAL / PRACTICAL		TERMWORK	
Sr. No.	Course Subject / Title	Credits	N0. Of Lectures	No. of Hours	Credits	No. of Hours	Credits	No. of Hours	Mode	marks	Total Marks	MIN.	MAX	MIN.	MAX	MIN.
1	PCC- DS801 Big Data Analytics	4	4	4			1	2	CIE	30	100	40	50	20	25	10
									ESE	70						
2	PCC- DS802 Data Visualization	3	3	3	1	1			CIE	30	100	40			25	10
									ESE	70						
3	PCE- DS803 Elective-II Project Management PCE- DS804 Elective-II Cyber Laws and Ethical Hacking PCE- DS805 Elective-II Augmented Reality and Virtual Reality	3	3	3	1	1			CIE	30	100	40			25	10
									ESE	70						
4	PCE- DS806 Elective-III Distributed and Cloud Computing PCE- DS807 Elective-III Software Testing and Quality Assurance PCE- DS808 Elective-III High Performance Computing	3	3	3	1	1			CIE	30	100	40			25	10
									ESE	70						
5	PCC- DS809 Web Technology	3	3	3			1	2					50	20	50	20

#	Subject																	
6	PW- DS810 Project – II						2	4					50	20	50	20		
7	HM-DS811 Professional Skills				1	2									50	20		
	Total (SEM –VIII)	*16*	*16*	*16*	*4*	*4*	*5*	*10*			*400*		*150*		*250*			
	Total	**32**	**32**	**32**	**6**	**6**	**12**	**22**			**800**		**300**		**500**			

CIE- Continuous Internal Evaluation

ESE – End Semester Examination

• Candidate contact hours per week : 30 Hours (Minimum)	• Total Marks for Final Yr. Sem VII & VIII : **800 + 800 =1600**
• Theory and Practical Lectures : 60 Minutes Each	• Total Credits for Final Yr. Sem VII & VIII: **50 (SEM-VII: 25 + SEM -VIII: 25)**
• In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE.	
• There shall be separate passing for theory and practical (term work) courses.	

Note:
1. **PCC-DS:** Professional Core Course – Data Science are compulsory.
2. **PCE-CS:** Professional Core Elective–Data Science are compulsory
3. **HM-CS:** Humanities and Management- Data Science are compulsory.
4. **PW-CS:** Domain Specific Mini Project -– Data Science are compulsory.
5. **SI-CS:** Internship- Data Science are compulsory.

Professional Core Elective – I
1. Information Retrieval System
2. Blockchain Technologies
3. Natural Language Processing

Professional Core Elective – II
1. Project Management
2. Cyber laws and Ethical Hacking
3. Augmented and Virtual Reality

Professional Core Elective – III

1. Distributed and Cloud Computing
2. Software Testing & Quality Assurance
3. High Performance Computing

1. Artificial Intelligence (PCC-DS701)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 4 Hrs./Week (4 Credits)	**Theory** **:** ESE 70 Marks CIE 30 Marks
Tutorial : 1 Hr. /Week (1 Credit)	**Term work: 25 Marks**
Practical :	**Practical : –**

Pre-requisites: Basic Programming in Python, Data Structures

Course Objectives

1. To impart artificial intelligence principles, techniques, and its history.

2. To assess the applicability, strengths, and weaknesses of the basic knowledge

representation, problem solving, and learning methods in solving engineering problems.

3. To develop intelligent systems by assembling solutions to concrete computational problems.

Course Outcomes

Upon successful completion of this course, the students will be able to:

1. Evaluate Artificial Intelligence (AI) methods and describe their foundations.

2. Apply basic principles of AI in solutions that require problem solving, inference,

perception, knowledge representation and learning.

3. Demonstrate knowledge of reasoning and knowledge representation for solving real world

problems.

4. Analyze and illustrate how search algorithms play vital role in problem solving.

5. Illustrate the construction of learning and expert system.

6. Discuss current scope and limitations of AI and societal implications.

Unit No	Unit Name and Details	No of Lectures
1	Artificial Intelligence and Its Issues: Definitions - Importance of AI, Evolution of AI - Applications of AI, Classification of AI systems with respect to environment, Knowledge Inferring systems and Planning, Uncertainty and towards Learning Systems.	8
2	Overview to Problem Solving&Heuristic Search: Problem solving by Search, Problem space - State space, Blind Search - Types, Performance measurement. Types, Game playing mini-max algorithm, Alpha-Beta Pruning	8
3	Probabilistic Reasoning & Markov Decision process: Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model. MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.	9
4	Learning Systems & Expert Systems: Forms of Learning Types - Supervised, Unsupervised, Reinforcement Learning, Learning Decision Trees. Expert Systems - Stages in the development of an Expert System - Probability based Expert Systems - Expert System Tools - Difficulties in Developing Expert Systems - Applications of Expert Systems.	9
5	Reinforcement Learning: Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.	8
6	AI with Python: Study of important inbuilt libraries of Python like NumPy, SciPy, matplotlib, nltk, Simple AI. Installing Python. Setting up PATH. Running Python. Study of real time applications of AI with Python, Case Studies: AI Platforms-Azure ML, Google AI, Swift AI, Tensorflow.	6

Term Work

- Minimum 8 tutorials to be performed from the list given below.
- Practical should include the implementation and use of the abovemechanisms/Algorithms/Tools /Techniques.
- Implementation can be in Python Programming Language.

Tutorial List

1. Write a program to conduct uninformed and informed search.

2. Write a program to conduct game search.

3. Write a program to construct a Bayesian network from given data.

4. Write a program to infer from the Bayesian network.

5. Write a program to run value and policy iteration in a grid world.

6. Write a program to do reinforcement learning in a grid world.

7. Develop small AI based Mini Project like:

i) Predicting user's next location

ii) Detecting YouTube comment spam

iii) Identifying the genre of a song

iv) Shock front classification

8. Case Study on any one real time AI application.

TEXT BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Artificial Intelligence - A Modern Approach	Russell, S. and Norvig, P.	3rd edition, Prentice Hall.2015
2	Artificial Intelligence: Foundations of Computational Agents	Poole, D. and Mackworth, A.	Cambridge University Press.2010

REFERENCES BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Artificial Intelligence,	Ric, E., Knight, K and Shankar, B.	Tata McGraw Hill.2009 3rd edition
2	Artificial Intelligence - Structures and Strategies for Complex Problem Solving	Luger, G.F.	6th edition, Pearson.2008
3	Knowledge Representation and Reasoning	Brachman, R. and Levesque, H.	Morgan Kaufmann.2004
4	Artificial Intelligence with Python: A Comprehensive Guide to Building Intelligent Apps for Python Beginners and Developers	Prateek Joshi	Packt publication January 2017 Edition
5	Reinforcement Learning: An Introduction	Sutton R.S. and Barto, A.G.	MIT Press.1998

6	Artificial Intelligence and Intelligent Systems	Padhy, N.P.	Oxford University Press.2009

2. R Programming (PCC-DS702)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week (3 Credits)	**Theory** : ESE 70 Marks CIE 30 Marks
Tutorial : -	**Term work: 25 Marks**
Practical : 2 Hr. /Week (1 Credit)	**Practical** : –

Prerequisite : Data visualization with Graphs

Course Objectives

The objective of this module to make students exercise the fundamentals of statistical analysis in R environment. They would be able to analysis data for the purpose of exploration using Descriptive and Inferential Statistics. Students will understand Probability and Sampling Distributions and learn the creative application of Linear Regression in multivariate context for predictive purpose.

Course Outcomes

At the end of this course, students will be able to:

1. Demonstration and implement of basic R programming framework and data structures

2. Explain critical R programming language concepts such as control structures and recursion

3. Applying mathematical and statistical operations data structures in R

4. Examine data-sets to create testable hypotheses and identify appropriate statistical tests

Unit No	Unit Name and Details	No of Lectures
1	**Introduction** How to Run R, A First R Session, Introduction to Functions, Variable Scope, Default Arguments, R Data Structures, Vectors, the R Workhorse, Character Strings, Matrices, Lists, Data Frames, Classes, Extended Example: Regression Analysis of Exam Grades, **Vectors** Scalars, Vectors, Arrays, and Matric, Common Vector Operations, Using all() and any(),Vectorized Operations, NA and NULL Values, Filtering, A Vectorized if-then-else: The if else() Function, Testing Vector Equality, Vector Element Names	6
2	**Matrices and Arrays** Creating Matrices, General Matrix Operations, Applying Functions to Matrix Rows and Column, Adding and Deleting Matrix Rows and Columns, Vector/Matrix Distinction, Avoiding Unintended Dimension Reduction, Naming Matrix Rows and Columns, Higher-Dimensional Arrays	6
3	**Lists and Frames** Creating Lists, General List Operations, Accessing List Components and Values, Applying Functions to Lists, Recursive Lists, Creating Data Frames, Other Matrix-Like Operations, Merging Data Frames, Applying Functions to Data Frames	8
4	**R Programming Structures**, Control Statements, Loops, -Looping Over Non vector Sets,-If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return-Returning Complex Objects, Functions are Objects, No Pointers in R, Recursion, A Quicksort Implementation-Extended Extended Example: A Binary Search Tree	6
5	**Doing Math and Simulation in R**, Math Function, Extended Example Calculating Probability-Cumulative Sums and Products-Minima and Maxima-Calculus, Functions For Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example Vector cross Product-Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, **Input /out put**, Accessing the Keyboard and Monitor, Reading and writing Files.	6
6	**Graphics**, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function –Customizing Graphs, Saving Graphs to Files..	6

Term Work

- Minimum 8 tutorials to be performed from the list given below.
- Practical should include the implementation and use of the above mechanisms/Algorithms/Tools /Techniques.

Experiment List

1. Download and install R-Programming environment and install basic packages using install.packages() command in R.

2. Learn all the basics of R-Programming (Data types, Variables, Operators etc,.)

3. Write a program to find list of even numbers from 1 to n using R-Loops.

4. Create a function to print squares of numbers in sequence.

5. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.

6. Implement different String Manipulation functions in R.

7. Implement different data structures in R (Vectors, Lists, Data Frames)

8. Write a program to read a csv file and analyze the data in the file in R.

9. Create pie chart and bar chart using R.

10. Create a data set and do statistical analysis on the data using R.

TEXT BOOKS:

Sr. No.	Title	Author(s) Name	Publication & Edition
1	R Programming for Data Science	Roger D. Peng	2012
2	The Art of R Programming- A Tour of Statistical Software Design	Norman Matloff	2011

REFERENCES:

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Hands-On Programming with R: Write Your Own Functions and Simulations	Garrett Grolemund, Hadley Wickham	1st Edition, 2014

3. Advanced Database Systems (PCC- DS703)

TEACHING SCHEME	EXAMINATION SCHEME
Theory :3 Hrs./Week (3 Credits)	**Theory** : ESE 70 Marks CIE 30 Marks
Tutorial :-	**Term work: 25 Marks**
Practical :2 Hrs. /Week (1 Credit)	**POE : 50 Marks**

Pre-requisites: - Database System

Course Objectives

1. To learn Basics of design of databases.

2. To acquire knowledge on parallel and distributed databases and its applications.

3. To study the usage and applications of SQL and NOSQL databases.

4. To Understand and perform common database administration tasks, such as

database monitoring, performance tuning, data transfer, and security.

5. To understand the usage of advanced data models.

Course Outcomes

Upon successful completion of this course, the students will be able to:

1.Understand and identify issues arising from parallel and distributed processing of data.

2. Select appropriate database and construct solution to real world problems of storing large data.

3. Compare and Contrast NoSQL databases with each other and Relational Database Systems.

4. Make use of SQL cursors, triggers, stored procedures, and procedural SQL

to write complexSQL scripts.

5.Learn database administration tasks and security measures.

Unit No	Unit Name and Details	No of Lectures
1	**Unit I: Parallel and Distributed Databases** Database System Architectures: Centralized and Client – Server Architectures, Server System Architectures, Parallel Systems, Parallel Database Architectures, Parallel Databases --I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism, Design of Parallel Systems, Distributed Systems, Distributed Database Concepts, Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control, Distributed Query Processing, Case Studies- Distributed Databases in Oracle.	6
2	**Unit II: Advanced SQL** Relational Set Operators, SQL Join Operators, Subqueries and CorrelatedQueries, SQL Functions, Oracle Sequences, Synonyms, Database Links, Updatable Views, Procedural SQL, Triggers, Stored Procedures, PL/SQL Processing with Cursors, PL/SQL Stored Functions, Embedded SQL, Dynamic SQL. Case study-Postgrey SQL.	6
3	**Unit III: NoSQL Database Management** **NOSQL: Definition and Introduction**, Features and Types of NOSQL databases, Sorted Ordered Column-Oriented Stores, Key/Value Stores, Document Databases, Graph Databases. **NOSQL: Getting Initial Hands-On Experience**, Storing and Accessing Data, Storing Data in and Accessing Data from MongoDB, Querying MongoDB**, Interfacing and Interacting with NOSQL**, Case Study-CouchDB, CouchDB vs. MongoDB, Compass / Atlas GUI Tools for MongoDB.	7
4	**Section – II** **Unit IV: Database Administration and Security** The Need for and Role of a Database in an Organization, The Evolution of the Database Administration Function, The Database Environment's Human Component Security, Database Administration Tools: The Data Dictionary, CASE Tools,developinga Data Administration Strategy, The DBA at Work: Using Oracle for Database Administration.	6
5	**Unit V: Business Intelligence and Data Warehouses** The Need for Data Analysis, Business Intelligence, Business Intelligence Architecture, Decision Support Data, The Data Warehouse, Online Analytical Processing, Star Schemas, Implementing a Warehouse, Data Mining, SQL Extensions for OLAP, Materialized Views, Case Study- FireBase-Google.	6
6	**Unit VI: Data analysis and exploration** Mathematical models for decision making, data mining, data preparation,data exploration. Data mining tasks - association rules.	6

Term Work

- Minimum10- 12 experiments to be performed from below mentioned experiment list.

Experiment List

1. Installation of Oracle / MySQL and practicing
   DDL & DML commands.Execute basic utilities
   used to interact with Oracle DBMS / MySQL.
2. Design and implement the Fragmentation schema & the
   Replication schema for the socialnetworking websites / online e-
   shopping / e-learning websites.
3. Implementation of 2 Phase Commit protocol for distributed databases.
4. Execute partitioning queries on parallel databases.
5. Implementation of Relational Set Operators, SQL Join queries, Subqueries
   and Correlated Queries,Oracle Synonyms and Sequence.
6. Demonstrate SQL Functions, Procedures, Cursors, and triggers using
   PL/SQL, Views.
7. Installation of MongoDB and Apache Cassandra.
8. Exploring MongoDB, and Apache Cassandra basics, Identify
   the schema design and datamodeling techniques in MongoDB.
9. Accessing MongoDB and Apache Cassandra from some of the
   popular high-level programming languages. Perform Create,
   Retrieve, Update and Delete or CRUD operationsin MongoDB.
10. Install CouchDB on Windows.
11. Create and delete CouchDB database. Run CouchDB query with Mongo.
12. Case study of Oracle Database
    Administration and Security.Study
    of database administrator's
    responsibilities like –
    - Installing and upgrading the database server and/or application
      tools.
    - Creating user's profiles and ensuring system security by careful
      allocation of user permissions.
    - Monitoring technical support for both database systems and related
      applications.
13. Study of CASE concept and tools.
14. Demonstrate all OLAP operations and cube operator in OLAP.
15. Consider a case study of any Big Data system of your choice
    and design the distributeddatabase architecture and analyze
    the probable solutions available in the market.
16. Demonstrate data analysis and visualization using any BI Tool.

TEXT BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Database System Concepts	Silberschatz, Korth, Sudarshan	MGH, 6th Edition (International edition) 2010	Unit 1
2	Database Systems, Design, Implementation andManagement	Coronel-Morris-Rob		Unit No.2, 4
3	Professional NOSQL	Shashank Tiwari	John Wiley & Sons, Inc. 2011	Unit No.3
4	Business Intelligence- Data Mining and optimization for Decision Making	Carlo Vercellis	Wiley Publications.	Unit No.5, 6

REFERENCE BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Database Management System	Raghu Ramkrishnan, JohannesGehrke,	MGH, [4e], 2015
2	Fundamentals of DatabaseSystems	R. Elmasri S. B. Navathe,	Addison Wesley, 2015
3	NoSQL Distilled: A brief guide to merging world of Polyglot persistence,	Pramod J. Sadalage and MarinFowler	Addison Wesley, 2012.
4	Advanced Database Management System	Rini Chakrabarti Shilbhadra Dasgupta	
5	Database Systems: A Practical Approach to Design, Implementation and Management,	Thomas Connolly, Carolyn Begg	6th Edition,2012.

4. Elective-I Information Retrieval System (PCE- DS704)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week (3 Credits)	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial :1 Hr. /Week (1 Credit)	**Term work: 25 Marks**
Practical :	**Practical : –**

Pre-requisites: - Database System

Course Objectives

1. Understand models like vector-space, probabilistic and language models to identify the similarity of query and document.

2. Implement clustering algorithms like hierarchical agglomerative clustering

3. Understand relevance feedback in vector space model and probabilistic model.

4. Illustrate how N-grams are used for detection and correction of spelling errors.

Course Outcomes

Upon successful completion of this course, the students will be able to:

1.Demonstrate genesis and diversity of information retrieval situations for text and hyper media.

2.Describe different techniques to retrieve information from www using semantic approaches.

3. Demonstrate the usage of different data/file structures in building computational search engines.

4.Analyze the performance of information retrieval using advanced techniques such as classification, clustering, and filtering over multimedia.

5. Analyze ranked retrieval of a very large number of documents with hyperlinks between them.

Unit No	Unit Name and Details	No of Lectures
1	**Unit I Introduction**: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses Retrieval strategies: vector space model, Probabilistic retrieval strategies: Simple term weights, Non binary independence model, Language models.	6
2	**Unit – II: Information Retrieval** Retrieval Utilities: Relevance feedback, clustering, N-grams, Regression analysis, Thesauri. Semantic networks, parsing Cross –Language: Information Retrieval: Introduction, Crossing the Language barrier.	6
3	**Unit III :Data Structure** Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models	7
4	**Section – II** **Unit IV: User Search Techniques** Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext.	6
5	**Unit V: Integrating structured data and text**. A historical progression, Information retrieval as relational application, Semi Structured search using a relational schema. Distributed Information Retrieval: A theoretical Model of Distributed retrieval, web search	6
6	**Unit VI: Multimedia Information Retrieval** Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval	6

Term Work

It should consist of minimum 8-10 assignments with emphasis on above concepts

TEXT BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Information Retrieval – Algorithms and Heuristics	David A. Grossman, OphirFrieder	Springer, 2nd Edition (Distributed by Universal Press), 2004
2	Information Storage and Retrieval Systems – Theory and Implementation	Gerald J. Kowalski, Mark T. Maybury,	Second Edition

REFERENCE BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Mining the Web : Discovering Knowledge from Hypertext Data,	Soumen Chakrabarti	Morgan – Kaufmann Publishers, 2002
2	An Introduction to Information Retrieval	Christopher D Manning, Prabhakar Raghavan, HinrichSchutze	Cambridge University Press, England, 2009.

5. Elective-I Blockchain Technologies (PCE- DS705)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week (3 Credits)	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial : 1 Hr. /Week (1 Credit)	**Term work: 25 Marks**
Practical :	**Practical :** –

Pre-requisites: Expertise In Programming, Basic Knowledge Of Computer Security, Cryptography,Networking, Concurrent Or Parallel Programming

Course Objectives

1) Understand how blockchain systems (mainly Bitcoin and Ethereum) work

2) To securely interact with bitcoin and ethereum

3) Design, build, and deploy smart contracts and distributed applications

4) Integrate ideas from blockchain technology into their own projects

Course Outcomes

Upon successful completion of this course, the students will be able to:

1. Explain design principles of Bitcoin and Ethereum.

2. Explain Nakamoto consensus.

3. Explain the Simplified Payment Verification protocol.

4. List and describe differences between proof-of-work and proof-of-stake consensus.

5. Interact with a blockchain system by sending and reading transactions.

6. Design, build, and deploy a distributed application.

Unit No	Unit Name and Details	No of Lectures
1	**Introduction** Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.	6
2	**Blockchain** Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee ,Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain	7
3	**Distributed Consensus:** Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.	6
4	**Cryptocurrency:** History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum -Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin	6
5	**Cryptocurrency Regulation:** Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy.	6
6	**Cryptocurrency Applications:** Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain	6

Term Work

Tutorials: Naive Blockchain construction, Memory Hard algorithm – Hashcash implementation, Direct Acyclic Graph, Play with Go-ethereum, Smart Contract Construction,Toy application using Blockchain, Mining puzzles

TEXT BOOK

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Gol	Princeton University Press (July 19, 2016).

REFERENCE BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	'Blockchain Technology: Cryptocurrency and Applications	S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan	Oxford University Press, 2019.
2	Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming	Josh Thompson	Create Space Independent Publishing Platform

6.Elective-I Natural Language Processing (PCE- DS706)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week (3 Credits)	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial :1 Hr. /Week (1 Credit)	**Term work: 25 Marks**
Practical :	**Practical : –**

Prerequisites: Mathematics

Course Objectives

1. To introduce the fundamental concepts and techniques of natural language processing

(NLP).

2. To gain an in-depth understanding of the computational properties of natural languages and

the commonly used algorithms for processing linguistic information.

3. To examines NLP models and algorithms using both the traditional symbolic and the more

recent statistical approaches.

Course Outcomes

Upon successful completion of this course, the students will be able to:

1. Acquire the knowledge of fundamental mathematical models and algorithms in the fields of

NLP

2. Apply these mathematical models and algorithms in application in software design and

implementation for NLP.

3. Apply deep learning models to solve machine translation and conversation problems.

4. Apply deep structured semantic models on information retrieval and natural language

applications.

Unit No	Unit Name and Details	No of Lectures
1	**Introduction** Introduction to various levels of natural language processing, Ambiguities and computational challenges in processing various natural languages. Introduction to Real life applications of NLP such as spell and grammar checkers, information extraction, question answering, and machine translation.	6
2	**Language Models :** The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models	5
3	**Part Of Speech Tagging and Sequence Labeling**: Stochastic POS tagging, HMM, Transformation based tagging (TBL), Handling of unknown words, named entities, multi word expressions	6
4	**Syntactic parsing**: Constituency, Context-Free Grammars, Some Grammar Rules for English, Treebanks, Grammar Equivalence and Normal Form, Lexicalized Grammars	6
5	**Semantic Analysis**: Lexical semantics and word-sense disambiguation. Compositional semantics. Semantic Role Labeling and Semantic Parsing.	6
6	**APPLICATIONS OF NLP:** NL Interfaces, Text Summarization, Sentiment Analysis, Machine Translation, Question answering, Recent Trends in NLP	7

Term Work

It should consist of minimum 8-10 assignments with emphasis on solving exercise problems

TEXT BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Speech and Language Processing	Daniel Jurafsky and James H Martin	2E, Pearson Education, 2009

REFERENCE BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Natural language Understanding	James A..	2e, Pearson Education,1994
2	Natural language processing: a Paninian perspective,	Bharati A., Sangat R., Chaitanya V..	PHI, 2000

7. Deep Learning (PCC- DS707)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week (3 Credits)	**Theory :**
Tutorial : -	**Term work: 50 Marks**
Practical : 2 Hr. /Week (1 Credit)	**Practical : 50 Marks**

Pre-requisites: Machine Learning

Course Objectives

1. Understand the basic concepts of deep learning networks

2. Introduce different models of deep learning to work with various types of inputs.

3. Learn effects of different parameters and hyper-parameters on deep learning model output.

Course Outcomes

Upon successful completion of this course, the students will be able to:

1. Describe basic concepts of artificial intelligence and deep learning.

2. Develop different deep learning models for given tasks.

3. Devise the correct parameters and hyper-parameters of developed model for getting

improved results.

Unit No	Unit Name and Details	No of Lectures
1	**Neural Network and Deep Learning** Introduction to AI, ML and Deep Learning, A brief history, Need of Deep Learning, Basics of neural network, Data representation for neural network, Gradient based optimization, anatomy of neural network.	7
2	**Introduction to Tensorflow, Keras and hyperparameters** **Tensorflow**: Introduction, Downloading and installation of Tensorflow, The computation graph, Modelling cyclic dependencies, Building and running visualization, Computing graph and distribution, Simple math operation and distribution, Tensors, Rank of tensors, Tensor math, Numpy and tensors, Tensorflow example, Keras: Introduction, Models, Layers, Pre-processing, Deep Learning case studies, Hyperparameters: Learning rate, No of iterations, hidden layers, hidden units, choice of activation function, momentum, mini batch size, Overfitting and underfitting, regularization	6
3	**Convolutional Neural Networks** The convolutional operation, The max pooling operation, Training a convnet from scratch on a small dataset, Using pre-trained convnet, Visualizing what convnet learn	8
4	**Sequence Models** One hot encoding, Using word embeddings, A recurrent layer in Keras, Understanding the LSTM and GRU layers, Example of LSTM in Keras, Advanced use of Recurrent Neural Network	7
5	**Advanced Deep Learning Best Practices** Going beyond the sequential model: The Keras functional API, Inspecting and monitoring deep learning models using Keras callbacks and Tensor Board, Getting the most out of your models	7
6	**Generative Deep Learning** Text generation with LSTM, Deep Dream, Neural Style Transfer, Generating images with variational auto encoders, Introduction to generative adversarial network	7

Term Work
- Minimum of 10 Tutorials to be performed from the list given below.
- Practical should include the implementation and use of the following mechanisms/Algorithms/Tools /Techniques

Experiment/Tutorial List

1. Installing of Anaconda or Miniconda and working with Tensorflow and Keras

2. Introduction and working with Google Colab for using GPUs and TPUs for large projects

3. Developing simple perceptron (single layer neural network)

4. Developing simple multilayer neural network for different tasks

5. Designing and developing basic CNN for given task

6. Using transfer learning in CNN

7. Designing and developing simple RNN for given task

8. Designing and developing RNN with LSTM for given task

9. Designing and developing RNN with GRU for given task

10. Designing and developing model for Text generation using LSTM

11. Designing and developing model for Neural style transfer

12. Designing and developing model for generating images

TEXT BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Deep Learning with Python	Francois Chollet	

REFERENCE BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Deep Learning	Ian Good fellow, Yoshua Bengio, Aaron Courville	MIT Press Book

8. Project -I (PW- DS708)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : --	**Theory** : --
Tutorial : -	**Term work: 50 Marks**
Practical : 4 Hr. /Week (2 Credit)	**Practical** : 50 Marks

Pre-requisites: Software Engineering, Mini Project.

Course Objectives

1. Identify the area of project work

2. Recognize the need and ability to engage in lifelong learning

3. Function effectively on teams and to communicate effectively

4. Able to prepare the technical report

Course Outcomes

Upon successful completion of this course, the students will be able to:

1. Explain the need of a software project for the society

2. Identify requirement analysis like functional and technical requirements for the project

3. Come up with design documents for the project consisting of Architecture, Dataflow diagram, Class Diagram, Algorithmic descriptions of various modules, collaboration diagram, ER Diagrams, Database Design Documents, Sequence Diagram, Use Case Diagram

4. Able to demonstrate analysis and design.

5. Prepare the technical report consisting of Requirement specification, Analysis and Design of Project

Contents

The project work is to be carried out in two semesters of Final Year Computer Science and Engineering.

The project should be undertaken preferably by group of 4-5 students who will jointly work and implement the project in the two semesters.

In Semester VII, the group will select a project with the approval of the Guide (staff member) and submit the Name of the project with a synopsis of the proposed work of not more than 02 to 08 pages before second week of August in the academic year. The group is expected to complete detailed system design, analysis, data flow design, procurement of hardware and/or software, implementation of a few modules of the proposed work at the end of semester –VIII as a part of the term work submission in the form of a joint report.

The term work assessment will be done jointly by teachers appointed by Head of the Institution.

The oral examination will be conducted by an internal and external examiner

Note:

1. Project work should be continually evaluated based on the contributions of the group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability, etc.

2. Two mid-term evaluations should be done, which includes presentations and demos of the work

done.

3. Care should be taken to avoid copying and outsourcing of the project work.

9. Internship (SI- DS709)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : --	Theory : --
Tutorial : -	Term work: 50 Marks
Practical : Minimum 4 Weeks Duration (2 Credit)	Practical : -

Pre-requisites: Completion of minimum of Six semesters, Knowledge of Basic Programming Languages, Database Software.

Course Objectives

The course is designed to expose the students to industry environment and to take up on-site assignment as trainees or interns.

Course Outcomes

At the end of this internship the student should be able to:

1. Have an exposure to industrial practices and to work in teams

2. Communicate effectively

3. Understand the impact of engineering solutions in a global, economic, environmental, and societal context

4. Develop the ability to engage in research and to involve in life-long learning

5. Comprehend contemporary issues

6. Engage in establishing his/her digital footprint

Duration: Minimum 4 Weeks

Details:

Four weeks of work at industry site.

Supervised by an expert at the industry.

Term Work

1. Mode of Evaluation: Internship Report, Presentation and Project Review.

2. Collect the Internship Completion Letter given by authorized industry.

3. Assess the work based on progress report (signed by industry expert).

Semester VIII

1. Big Data Analytics (PCC- DS707)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 4 Hrs./Week (4 Credits)	**Theory** : ESE 70 Marks CIE 30 Marks
Tutorial : -	**Term work: 25 Marks**
Practical : 2 Hr. /Week (1 Credit)	**Practical :50 Marks**

Pre-requisites: Operating Systems, Hadoop, Java, Networking, Machine Learning and Databases.

Course Objectives

1. Analyze several key technologies used in manipulating, storing, and analyzing big data.

2. Acquire clear understanding of R & Hadoop.

3. Acquire clear understanding of Integrating R & Hadoop and Acquire clear understanding of Hadoop Streaming and its importance.

4. Manage Big Data and analyze Big Data.

5. Apply tools and techniques to analyze Big Data.

Course Outcomes

Upon successful completion of this course, the students will be able to:

1. Analyze several key technologies used in manipulating, storing, and analyzing big data.

2. Acquire clear understanding of R & Hadoop.

3. Acquire clear understanding of Integrating R & Hadoop and Acquire clear understanding of Hadoop Streaming and its importance.

4. Manage Big Data and analyze Big Data.

5. Apply tools and techniques to analyze Big Data.

Unit No	Unit Name and Details	No of Lectures
1	**INTRODUCTION TO BIG DATA :** Big Data and its Importance – Four V's of Big Data – Drivers for Big Data –Introduction to Big Data Analytics – Big Data Analytics applications, Architecture Components, Massively Parallel Processing (MPP) Platforms, Unstructured Data Analytics and Reporting, Big Data and Single View of Customer/Product, Data Privacy Protection, Real-Time Adaptive Analytics and Decision Engines.	**8**

2	**INTRODUCTION TO R &HADOOP :** Getting Ready to Use R and Hadoop, Installing R, Installing R Studio, Understanding the features of R language, Installing Hadoop, Understanding Hadoop features, Learning the HDFS and MapReduce architecture, Writing Hadoop MapReduce Programs, Introducing Hadoop MapReduce, Understanding the Hadoop MapReduce fundamentals, Writing a Hadoop MapReduce example, Learning the different ways to write Hadoop MapReduce in R, Hadoop Ecosystem, Hadoop YARN, Hbase, Hive, Pig and Pig latin, Sqoop, ZooKeeper, Flume, Oozie.	**8**
3	**INTEGRATION OF R & HADOOP :** Integrating R and Hadoop, Introducing RHIPE, Understanding the architecture of RHIPE, Understanding RHIPE samples, Understanding the RHIPE function reference, Introducing RHadoop, Understanding the architecture of RHadoop, Understanding RHadoop examples, Understanding the RHadoop function reference. HADOOP STREAMING WITH R Using Hadoop Streaming with R - Introduction, Understanding the basics of Hadoop Streaming, Understanding how to run Hadoop streaming with R, Understanding a MapReduce application, Exploring the Hadoop Streaming R package	9
4	**DATA ANALYTICS WITH R AND HADOOP :** Understanding the data analytics project life cycle – Introduction, Identifying the problem, Designing data requirement, Preprocessing data, Performing analytics over data, Visualizing data, Understanding data analytics problems, Exploring web pages categorization Case Studies: Computing the frequency of stock market change, Predicting the sale price of blue book for bulldozers	9
5	**SPARK FOR BIG DATA ANALYTICS** : The advent of Spark, Limitations of Hadoop, Overcoming the limitations of Hadoop, Theoretical concepts in Spark: Resilient distributed datasets, Directed acyclic graphs, Spark Context, Spark Data Frames, Actions and transformations, Spark deployment options, Spark APIs, Core components in Spark: Spark Core, Spark SQL, Spark Streaming, GraphX, MLlib, The architecture of Spark	7
6	**UNDERSTANDING BIG DATA ANALYSIS WITH MACHINE LEARNING :** Introduction to machine learning, Types of machine-learning algorithms, Supervised machine learning algorithms, Unsupervised machine learning algorithm, Recommendation algorithms, Steps to generate recommendations in R, Generating recommendations with R and Hadoop.	7

Term Work

- Minimum of 10-12 Experiments to be performed from the list given below.

Experiment List

1. Installation of Hadoop.

2. Building Hadoop MapReduce application for counting frequency of word/phrase in simple text file.

3. Study and demonstration of Hadoop YARN Administration command and User commands.

4. Configure Hive demonstrate following

   • Write and execute a Hive query

   • Define Hive External table

   • Define Partitioned Hive Table

5. Demonstrate following on Hive

   • Load data into Hive table from HDFS

   • Update row in Hive table

   • Delete row from a Hive Table

6. Working with operators in Pig - FOREACH, ASSERT, FILTER, GROUP, ORDERBY, DISTINCT, JOIN, LIMIT, SAMPLE, SPLIT,FLATTEN.

7. Write and execute a Pig script

   • Load data into a Pig relation without a schema

   • Load data into a Pig relation with a schema

   • Load data from a Hive table into a Pig relation

8. Installation of R studio and demonstration of following

   • R basic Syntax.

   • Exploring basic R Data Types.

   • Drawing Pie chart, Bar Chart, Histogram, etc.

   • R array and Vector.

9. Working with R with data sets- create, read, write and R Tables- create, read, write.

10. Manipulating and processing data in R - merging datasets, sorting data, putting data into shape, managing data using matrices managing data using data frames.

11. Study of RHIPE (R and Hadoop Integrated Programming Environment)

   • Installing Hadoop.

   • Installing R.

   • Installing protocol buffers.

   • Setting up environment variables.

   • Installing rJava.

• Installing RHIPE.

12. Identifying the frequency of all the words that are present in the provided input text files using RHIPE Environment.

13. Installation and configuration of Apache Spark on Local Machine.

14. Write an application to Read multiple text files into single RDD using Spark.

15. Implementation of Linear regression with R and Hadoop.

16. Case studies should consist of but not limited to following: Big Data Analytics in Healthcare, Big Data Analytics In Immunology: A Knowledge-Based Approach, Big Data Analytics Embedded Smart City Architecture For Performance Enhancement Through Real-Time Data Processing And Decision-Making.

17. Case Study How Data Science Helped in development COVID-19 Vaccine.

TEXT BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Big Data Analytics: Disruptive Technologies for Changing the Game	Arvind Sathi	IBM Corporation, 2012
2	Big Data Analytics with R and Hadoop	Vignesh Prajapati	Packt Publishing 2013
3	Practical Big Data Analytics	Nataraj Dasgupta	Packt Publishing 2018

REFERENCE BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Big Data (Black Book)	DT Editorial Services	Dreamtech Press

2	Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business	Michael Minelli, Michehe Chambers	Wiely CIO Series, 2013.
3	Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics	Bill Franks	Wiley and SAS Business Series, 2012
4	Hadoop: The Definitive Guide	Tom White	O'reilly, 2012
5	Big Data Analytics	Seema Acharya, Subhasini Chellappan	Wiley, 2015
6	Big Data Analytics with Hadoop 3	Sridhar Alla	Packt Publishing, 2018
7	Big Data Analytics: Methods and Applications	Jovan Pehcevski	Arcler Press

2.Data Visualization (PCC- DS706)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week (3 Credits)	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial :1 Hr. /Week (1 Credit)	**Term work: 25 Marks**
Practical :	**Practical : –**

Prerequisite : Data Analytics

Course Objectives

1. To develop skills to both design and critique visualizations.
2. To introduce visual perception and core skills for visual analysis.
3. To understand visualization for time-series analysis.
4. To understand visualization for analysis after acquiring data.

Course Outcomes:

Upon completion of the course, the students should be able to:

1. Explain principles of visual perception
2. Apply core skills for visual analysis
3. Apply visualization techniques for various data analysis tasks
4. Apply different tools and techniques for acquiring data

Unit No	Unit Name and Details	No of Lectures
1	**The Seven Stages of Visualizing Data** Why Data Display Requires Planning, An Example, Iteration and Combination , Principles, Getting Started with Processing, Sketching with Processing, Exporting and Distributing Your Work, Examples and Reference, Functions, Sketching and Scripting	7
2	**Time Series** Milk, Tea, and Coffee (Acquire and Parse),Cleaning the Table (Filter and Mine), A Simple Plot (Represent and Refine) Labeling the Current Data Set (Refine and Interact), Drawing Axis Labels (Refine), Choosing a Proper Representation (Represent and Refine), Using Rollovers to Highlight Points (Interact) Ways to Connect Points (Refine), Text Labels As Tabbed Panes (Interact), Interpolation Between Data Sets (Interact) ,End of the Series	6
3	**Connections and Correlations** Problem Statement Preprocessing Using the Preprocessed Data (Acquire, Parse, Filter, Mine), Displaying the Results (Represent) Returning to the Question (Refine),Sophisticated Sorting: Using Salary As a Tiebreaker (Mine), Moving to Multiple Days (Interact), Smoothing Out the Interaction (Refine),Deployment Considerations (Acquire, Parse, Filter)	6
4	**Scatterplot Maps** Preprocessing Loading the Data (Acquire and Parse) .Drawing a Scatterplot of Zip Codes (Mine and Represent) ,Highlighting Points While Typing (Refine and Interact) ,Show the Currently Selected Point (Refine), Progressively Dimming and Brightening Points (Refine) ,Zooming In (Interact) , Changing How Points Are Drawn When Zooming (Refine) ,Deployment Issues (Acquire and Refine)	6
5	**Trees, Hierarchies, and Recursion** Using Recursion to Build a Directory Tree Using a Queue to Load Asynchronously (Interact) ,An Introduction to Treemaps, Which Files Are Using the Most Space?. Viewing Folder Contents (Interact), Improving the Treemap Display (Refine), Flying Through Files (Interact) ,Next Steps	6
6	**Acquiring Data** Where to Find Data ,Tools for Acquiring Data from the Internet, Locating Files for Use with Processing ,Loading Text Data, Dealing with Files and Folders ,Listing Files in a Folder ,Asynchronous Image Downloads ,Using open Stream ( ) As a Bridge to Java ,Dealing with Byte Arrays ,Advanced Web Techniques, Using a Database , Dealing with a Large Number of Files	5

Term Work

- Minimum of 10 Tutorials to be performed with the use of different data visualization tools and techniques.

TEXTBOOKS AND REFERENCE BOOKS:

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Visualizing data: Exploring and explaining data with the processing environment	Ben Fry	O'Reilly, 2008
2	The visual display of quantitative information	Edward R. Tufte	Second Edition, Graphics Press, 2001
3	The value of business analytics: Identifying the path to profitability"	Evan Stubbs	Wiley, 2011.
4	Business Analytics for Managers: Taking business intelligence beyond reporting",	Gert H. N. Laursen and Jesper Thorlund,	Wiley, 2010
5	Data Points: Visualization that means something	Nathan Yau	Wiley, 2013
6	Information dashboard design: Displaying data for at-a-glance monitoring,	Stephen Few	second edition, Analytics Press, 2013.
7	Now you see it: Simple Visualization techniques for quantitative analysis	Stephen Few	Analytics Press, 2009

8	Visualization Analysis and Design, AK Peters Visualization Series,	Tamara Munzner	CRC Press, Nov. 2014

3. Elective-II Project Management (PCE- DS803)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week (3 Credits)	**Theory** : ESE 70 Marks CIE 30 Marks
Tutorial :1 Hr. /Week (1 Credit)	**Term work: 25 Marks**
Practical :	**Practical** : –

Pre-requisites: Software Engineering Concept, Operations Management

Course Objectives

1. Provide students with a basic understanding of project management principles and practices.

2. Demonstrate competency in the creation and management of a project plan

3. Understanding impact of Scope, Time and Cost management.

4. Understanding the software quality metrics and quality assurance.

5. Develop strategies to calculate risk factors involved in IT projects

6. Understand the Agile development practices and driving forces for taking an Agile approach to software development.

Course Outcomes

Upon successful completion of this course, the students will be able to:

1. Understand project characteristics and various stages of a project.

2. Understand the conceptual clarity about project organization and feasibility analyses

3. Analyze the learning and understand techniques for Project planning, project risk, scheduling and Execution

4. Resolve IT related crises using project management

5. Manage the phases and infrastructure of IT projects

6. Describe fundamental concepts of agile methodology and agile development practices

Unit No	Unit Name and Details	No of Lectures
1	**Introduction to Project Management**: Project and Project Management (PM), Role of project Manager, System view of PM, Organization, Stakeholders, Project phases and lifecycle, Context of IT projects, process groups, mapping groups to Knowledge areas	**5**
2	**Project Integration Management**: Strategic planning and project selection, Developing a Project Management Plan, Directing and Managing Project Work, Monitoring and Controlling Project Work, Performing Integrated Change Control, Closing Projects or Phases	**6**
3	**Project Scope, Time and Cost management:** Planning Scope Management, Collecting Requirements, Defining Scope, Creating the Work Breakdown Structure, Validating Scope, Controlling Scope Planning Schedule Management, Defining Activities, Sequencing and Estimating Activity, Resources & Duration, Developing & Controlling Schedule Basic Principles of Cost Management, Planning Cost Management, Estimating Costs, Determining the Budget, Controlling Costs	6
4	**Quality and Human Resource Management:** Importance, Planning Quality Management, Performing Quality Assurance, Controlling Quality, Tools and Techniques for Quality Control, Human Resource management: Importance, keys to managing people, human resource planning, acquiring, developing and managing project team.	**7**
5	**Risk management**: Importance, risk management planning, sources of risk, risk identification, qualitative and quantitative risk analysis, risk response planning, risk monitoring and control.	**6**
6	**Agile Project Management**: The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects	**6**

Term Work

- It should consist of minimum 8 – 10 assignments based on the above topics.

TEXTBOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Information Technology Project Management	Kathy Schwalbe	Cengage Learning 7E
2	Software Project Management	Bob Huges, Mike Cotterell, Rajib Mall	McGraw Hill Edu

REFERENCE BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Effective Project Management	Robert K.Wysocki	Wiley India 7 Edition
2	Project Management Core Textbook	Mantel Jr., Meredith, Shafer, Sutton, Gopalan	Wiley India Edition
3	IT Project Management	Joseph Phillips	3E McGraw Hill Edu

4. Elective-II Cyber Laws and Ethical Hacking (PCE- DS804)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week (3 Credits)	**Theory** : ESE 70 Marks CIE 30 Marks
Tutorial :1 Hr. /Week (1 Credit)	**Term work: 25 Marks**
Practical :	**Practical : –**

Prerequisite: Computer Network ,Basics of Cyber Security

Course Objectives
The Objectives of this course is to enable learner to understand, explore, and acquire a critical understanding Cyber Law and Ethical Hacking. Develop competencies for dealing with frauds and deceptions (Confidence Tricks, Scams) and other Cyber Crimes that are taking place via internet.

Course Outcomes
After the end of this course students will be able to
1. Understand fundamentals of cyber space

2. Understand IT act 2000 and its details

3. Describe electronics governance and Indian Evidence Law

4. Implement Intrusion Detection, Policy Creation, Social Engineering

Unit No	Unit Name and Details	No of Lectures
1	**Cyber Space-** Fundamental definitions -Interface of Technology and Law – Jurisprudence and-Jurisdiction in Cyber Space - Indian Context of Jurisdiction -Enforcement agencies – Need for IT act - UNCITRAL – E-Commerce basics .Information Technology Act, 2000 - Aims and Objects — Overview of the Act – Jurisdiction	6
2	**Electronic Governance** – Legal Recognition of Electronic Records and Electronic Evidence -Digital Signature Certificates - Securing Electronic records and secure digital signatures - Duties of Subscribers - Role of Certifying Authorities - Regulators under the Act -The Cyber Regulations Appellate Tribunal - Internet Service Providers and their Liability– Powers of Police under the Act – Impact of the Act on other Laws . Cyber Crimes -Meaning of Cyber Crimes –Different Kinds of Cyber crimes – Cyber crimes under IPC,	7
3	**Cr.P.C and Indian Evidence Law** - Cyber crimes under the Information Technology Act,2000 - Cyber crimes under International Law - Hacking Child Pornography, Cyber Stalking, Denial of service Attack, Virus Dissemination, Software Piracy, Internet Relay Chat (IRC) Crime, Credit Card Fraud, Net Extortion, Phishing etc - Cyber Terrorism-Violation of Privacy on Internet - Data Protection and Privacy – Indian Court cases.	6
4	**Intellectual Property Rights** – Copyrights- Software – Copyrights vs Patents debate - Authorship and Assignment Issues - Copyright in Internet - Multimedia and Copyright issues - Software Piracy - Trademarks - Trademarks in Internet – Copyright and Trademark cases,	6
5	**Introduction to Ethical Hacking** Types of Data Stolen From the Organizations, Elements of Information Security, Authenticity and Non-Repudiation, Security Challenges, Effects of Hacking, Hacker – Types of Hacker, Ethical Hacker.	5
6	**Penetration Testing** Hacktivism - Role of Security and Penetration Tester, Penetration Testing Methodology, Networking & Computer Attacks – Malicious Software (Malware), Protection Against Malware, Intruder Attacks on Networks and Computers	6

Term Work

- It should consist of minimum 8 – 10 assignments based on the above topics.

TEXTBOOKS AND REFERENCE BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Cyber Laws	Justice Yatindra Singh	Universal Law Publishing Co., New Delhi
2	Cyber Law in India,	Farouq Ahmed	New Era publications, New Delhi
3	Information Technology Law(Cyber Laws)	S.R.Myneni	Asia Law House, Hyderabad
4	Internet Law-Text and Materials	Chris Reed	Cambridge University Press
5	Cyber Law- the Indian perspective	Pawan Duggal	Universal Law Publishing Co., New Delhi
6	Hands-On Ethical Hacking and Network Defense	Michael T. Simpson, Kent Backman, James E, "Corley,	Second Edition, CENGAGE Learning, 2010.
7	Official Certified Ethical Hacker Review Guide",	Steven DeFino, Barry Kaufman, Nick Valenteen	CENGAGE Learning, 2009-11-01.

5. Elective-II Augmented Reality and Virtual Reality (PCE- DS805)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week (3 Credits)	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial : 1 Hr. /Week (1 Credit)	**Term work: 25 Marks**
Practical :	**Practical : –**

Prerequisites: Numerical & Statistical Methods, Artificial Intelligence, Machine Learning,

Course Objectives:

1. Learn the fundamental Computer Vision, Computer Graphics and Human-Computer

interaction Techniques related to VR/AR

2. Review the Geometric Modelling Techniques

3. Review the Virtual Environment

4. Discuss and Examine VR/AR Technologies

Course Outcome

On completion of the course the learner will be able to;

1. Understand fundamental Computer Vision, Computer Graphics and Human-Computer

Interaction Techniques related to VR/AR

2. Understand Geometric Modelling Techniques

3. Understand the Virtual Environment

4. Analyse VR/AR Technologies

5. Apply various types of Hardware and Software in Virtual Reality systems

Unit No	Unit Name and Details	No of Lectures
1	**Introduction to Virtual Reality (VR)** Virtual Reality and Virtual Environment, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark	6
2	**Computer Graphics and Geometric Modelling** The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, Color theory, Conversion From 2D to 3D, 3D space curves, 3D boundary representation, Simple 3D modelling, 3D clipping, Illumination models, Reflection models, Shading algorithms, Geometrical Transformations: Introduction, Frames of reference,Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection	7
3	**Virtual Environment** Input/Output Devices: Input (Tracker, Sensor, Digital Gloves, Movement Capture, Video-based Input, 3D Menus & 3D Scanner, etc.), Output (Visual/Auditory/Haptic Devices) Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft	6
4	**Virtual Environment and Generic VR system:** Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems, Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system	6
5	**Augmented Reality (AR)** Taxonomy, Technology and Features of Augmented Reality, AR Vs VR, Challenges with AR, AR systems and functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality, Enhancing interactivity in AR Environments, Evaluating ARsystems	6
6	**AR / VR Applications** Introduction, Engineering, Entertainment, Science, Training, Game Development	5

Term Work
- It should consist of minimum 8 – 10 assignments based on the above topics.

TEXT BOOKS

1. Coiffet, P., Burdea, G. C., (2003), "Virtual Reality Technology," Wiley-IEEE Press, ISBN: 9780471360896

2. Schmalstieg, D., Höllerer, T., (2016), "Augmented Reality: Principles & Practice," Pearson, ISBN: 9789332578494

3. Norman, K., Kirakowski, J., (2018), " Wiley Handbook of Human Computer Interaction," Wiley-Blackwell, ISBN: 9781118976135

4. LaViola Jr., J. J., Kruijff, E., McMahan, R. P., Bowman, D. A., Poupyrev, I., (2017), "3D User Interfaces: Theory and Practice," Pearson, ISBN: 9780134034324

5. Fowler, A., (2019), "Beginning iOS AR Game Development: Developing Augmented Reality Apps with Unity and C#," Apress, ISBN: 9781484246672

6. Hassanien, A. E., Gupta, D., Khanna, A., Slowik, A., (2022), "Virtual and Augmented Reality for Automobile Industry: Innovation Vision and Applications," Springer, ISBN: 9783030941017

REFERENCES

1, A. B., Sherman, W. R., Will, J. D., (2009), "Developing Virtual Reality Applicat. Craig, A. B., (2013), "Understanding Augmented Reality, Concepts and Applications," Morgan Kaufmann, ISBN: 9780240824086

2. Craigions, Foundations of Effective Design," Morgan Kaufmann, ISBN: 9780123749437

3. John Vince, J., (2002), "Virtual Reality Systems, " Pearson, ISBN: 9788131708446

4. Anand, R., "Augmented and Virtual Reality," Khanna Publishing House

5. Kim, G. J., (2005), "Designing Virtual Systems: The Structured Approach", ISBN: 9781852339586

6. Bimber, O., Raskar, R., (2005), "Spatial Augmented Reality: Merging Real and Virtual Worlds," CRC Press, ISBN: 9781568812304

7. O'Connell, K., (2019), "Designing for Mixed Reality: Blending Data, AR, and the Physical World," O'Reilly, ISBN: 9789352138371

8. Sanni Siltanen, S., (2012), "Theory and applications of marker-based augmented reality," Julkaisija –Utgivare Publisher, ISBN: 9789513874490

6. Elective-III Distributed and Cloud Computing (PCE- DS806)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week (3 Credits)	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial :1 Hr. /Week (1 Credit)	**Term work: 25 Marks**
Practical :	**Practical : –**

Prerequisite: Computer Network Basics, Operating System

Course Objectives

1. To make students understand Distributed systems and its concepts
2. Learn the concepts in Cloud computing and Virtualization
3. Familiarize Components of Cloud, different computing models.
4. Discuss thecloud computing services, delivery models and cloud types.
5. To study their applications, features, service providers , vendors and associated industry standards.

Course Outcomes

1. Explain the principles underlying the functioning of distributed systems
2. Apply the algorithms used in distributed system & visualize their working
3. Explain Cloud Infrastructure and their Components
4. Make use of different virtualization techniques
5. Explain various cloud computing services and data security aspects in cloud

Unit No	Unit Name and Details	No of Lectures
1	**Distributed system paradigms** Definition, goals, architecture, Types of distributed system, Architectural styles, system architectures	5
2	**Processes, Communication & Synchronization** Remote procedure calls, synchronization, clock synchronization, logical clock, mutual exclusion, election algorithms	6
3	**Cloud Computing Basics** Cloud computing fundamentals, the role of networks in Cloud computing, Essential characteristics of Cloud computing, Cloud deployment model, Cloud service models, Multitenancy, Cloud cube model, Cloud economics and benefits, Cloud types and service scalability over the cloud, challenges in cloud NIST guidelines. **Cloud Computing Framework:** Amazon EC2, S3 storage, Load Balancer	6
4	**Virtualization** Introduction &Benefits, Implementation levels of Virtualization, Virtualization at OS level, Virtualization structure, Virtualization Mechanism, Open source Virtualization Technology, Xen Virtualization Architecture, Binary translation with full Virtualization, paravirtualization, Virtualization of CPU, memory and I/O devices	6
5	**Exploring cloud services** Software as a Service – Overview, advantages, examples. Platform as a Service – overview, advantages and functionalities, PaaS application frameworks – Drupal, Long Jump. Case study – Google Apps and Web Services.	6
6	**Data security in cloud** Security Overview, Cloud Security Challenges and Risks, General Issues Securing the Cloud, Securing Data, Data Security, Application Security, Virtual Machine Security. Identity and Presence, Identity Management and Access Control, Disaster Recovery in Clouds	7

Term Work

- It should consist of minimum 8 – 10 assignments based on the above topics.

TEXT BOOKS

Sr. No	Title	Author	Publisher
01	Distributed Systems-Principles & paradigms	Andrew S. Tanenbaum	Pearson
02	Cloud Computing Bible	Barrie Sosinsky,	Wiley
03	Cloud Computing Black Book	Kailash Jayaswal Dr.Deven Shah	Dreamtech Press

REFERENCE BOOKS

Sr. No	Title	Author	Publisher
01	Distributed Systems – Concepts & Design	George Koulouris, Jean Dollimore, TimKindberg	Pearson Education
02	Cloud Computing Principles and Paradigms	RajkumarBuyya James Broberg, Andrzej Goscinski	Wiley

7. Elective-III Software Testing Quality and Assurance (PCE- DS807)

TEACHING SCHEME	EXAMINATION SCHEME
Theory **:** 3 Hrs./Week (3 Credits)	**Theory** **:** ESE 70 Marks CIE 30 Marks
Tutorial :1 Hr. /Week (1 Credit)	**Term work: 25 Marks**
Practical :	**Practical : –**

Pre-requisites: Software Engineering, SDLC and STLC

Course Objectives

1. To understand software testing and quality assurance as a fundamental component of software

life cycle

2. To understand the fundamentals of software verification

3. To efficiently perform Testing & QA activities using modern software tools

4. To understand and compare testing web applications and desktop applications

Course Outcomes

Upon successful completion of this course, the students will be able to:

1. Understand fundamental component of software life cycle

2. Apply and use the modern software testing tools

3. Compare and analyze the web and desktop application testing

4. Explore newer software project assessment methods

Unit No	Unit Name and Details	No of Lectures
1	**Introduction** : Some Software Failures, Testing Process, Some terminologies, Limitations of Testing, The V Shaped software life cycle model	5
2	**Software Verification**: Verification Methods, SRS document verification, SDD document verification, Source code reviews, User documentation verification, Software project audit Creating test cases from SRS and Use cases: Use Case Diagram and Use Cases, Generation of test cases from use cases, Guidelines for generating validity checks, strategies for data validity, Database testing	6
3	**Regression Testing**: What is regression testing?, Regression Test cases selection, Reducing the number of test cases, Risk analysis, Code coverage prioritization techniques Object oriented testing: What is Object orientation?, What is object oriented testing?, Path testing, State based testing, Class testing	6
4	**Software Testing Tools**: Selecting and Installing Software Testing tools, Automation and Testing Tools, Load Runner, Win runner and Rational Testing Tools,Silk test, Java Testing Tool	6
5	**Testing Process** : Seven Step Testing Process – I: Overview of the Software Testing Process, Organizing of Testing, Developing the Test Plan, Verification Testing, Validation Testing	6
6	**Testing Web applications** What is web testing? functional testing, UI testing, Usability testing, configurations and compatibility testing, security testing, performance testing, database testing, post deployment testing, web metrics. Automated Test data generation: Automated Test Data generation, Approaches to test data generation, Test data generation tools	7

Term Work
- Minimum of 10 Tutorials to be done from the list given below.
- It should include the demonstration and use of the Tools /Technique

Guidelines for tutorials:

It should consist of 8-10 assignments based on the following topics:

1. Software Testing Process, its need and limitations
2. Verification at different phases of SDLC for particular case study (SRS document verification, SDD

document verification, Source code reviews, User documentation verification, Software project audit etc.)

3. Creating test cases from SRS and Use cases for particular case study
4. Generation of validity checks for particular case study
5. Regression testing with Test cases selection / Regression testing with reducing the number of test cases /Regression testing with code coverage prioritization techniques
6. Generation of test cases using Path testing/ State based testing/Class testing for particular case

Study

7. Measurement in Software Engineering
8. Software Metrics: Object oriented Metrics used in testing
9. Calculation of Software Quality attributes using different prediction models
10. Measurement of Internal / External Product Attributes
11. Generation of test cases in different key areas of Web application testing
12. Automated test data generation

TEXT BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Software testing:	Yogesh Singh,	Cambridge University Press, First Edition
2	Effective Methods for Software Testing	William E. Perry,	Third edition, Wiley India, 2009
3	Software Testing – Principles and Practices	Naresh Chauhan	Oxford University Press, 2010

REFERENCE BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Foundations of Software testing:	Aditya P. Mathur,	Pearson, Second Edition
2	Software Testing	Ron Patton	Pearson (SAMS), Second Edition

8. Elective-III High Performance Computing (PCE- DS808)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week (3 Credits)	**Theory** : ESE 70 Marks CIE 30 Marks
Tutorial :1 Hr. /Week (1 Credit)	**Term work: 25 Marks**
Practical :	**Practical : –**

 Prerequisite:- Computer Organization , Computer Algorithms

Course Objectives

1. To introduce the current trends in computer architecture and programming model.

2. To understand Parallel Hardware and Parallel Software.

3. To learn Distributed-Memory Programming with MPI.

4. To learn Shared-Memory Programming with Pthreads.

5. To learn Shared-Memory Programming with OpenMP.

6. To solve basic parallel problems.

Course Outcomes

Upon successful completion of this course, the students will be able to:

1. To introduce the current trends in computer architecture and programming model.

2. To explain Parallel Hardware and Parallel Software.

3. To apply and use Distributed-Memory Programming with MPI.

4. To apply and use Shared-Memory Programming with Pthreads.

5. To apply and use Shared-Memory Programming with OpenMP.

6. Program parallel architectures.

Unit No	Unit Name and Details	No of Lectures
1	**Introduction** Need of Ever-Increasing Performance, Building Parallel Systems, Need to Write Parallel Programs, Concurrent, Parallel, Distributed, Typographical Conventions, Cluster Computing - architecture, Classifications, Grid Computing - Architecture, Applications	5
2	**Parallel Hardware and Parallel Software** Modifications to the von Neumann Model, Parallel Software, Input and Output, Performance, Parallel Program Design, Writing and Running Parallel Programs	6
3	**Distributed-Memory Programming with MPI** Compilation and execution, MPI programs, SPMD programs, The Trapezoidal Rule in MPI, Dealing with I/O, Tree-structured communication, MPI Reduce, Collective vs. point-to-point communications, MPI Allreduce, Broadcast, Data distributions, MPI Derived Datatypes, Performance Evaluation of MPI Programs	6
4	**Shared-Memory Programming with Pthreads** Processes, Threads, and Pthreads, Hello World , Matrix-Vector Multiplication, Critical Sections, Busy-Waiting, Mutexes, Producer-Consumer Synchronization and Semaphores, Barriers and Condition Variables	6
5	**Shared-Memory Programming with OpenMP** Compiling and running OpenMP programs, The program, The Trapezoidal Rule, Scope of Variables, The Reduction Clause, The parallel forDirective, More About Loops in OpenMP: Sorting, Scheduling Loops	6
6	**Parallel Program Development** Two n-Body Solvers, Recursive depth-first search, Non recursive depth-first search, Data structures for the serial implementations, Performance of the serial implementations, Parallelizing tree search, A static parallelization of tree search using Pthreads, A dynamic parallelization of tree search using Pthreads, Evaluating the pthreads tree-search programs	7

Term Work

- Term Work should consist of 10 assignments based on the following list. At least one assignment must be from each unit.

1. Write a short note on significance of parallel programming to enrich the computational performance.

2. Enumerate the fundamental prerequisites of parallel programming.

3. Explain the modified architecture of von Neumann model.

4. Describe parallel program design with running process.

5. Explain the Trapezoidal rule in MPI.

6. How the evaluation for performance of MPI is done?

7. What is Pthread? Write a note on Pthread creation, finish. Explain Pthread API.

8. Explain: a) Mutexes b) barriers c) busy waiting

9. Explain the following terms with respect to OpenMp

a. The trapezoidal rule

b. Scope of the variable

10. Explain various loops in OpenMp with example.

11. Write short note on two n-body solvers.

12. Write dawn Difference between Recursive depth - first search and Non Recursive depth – first search

TEXT BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	An Introduction to Parallel Programming	Peter S. Pacheco	Elsevier, 2011
2	Introduction to Grid Computing	Bart Jacob, Michael Brown, Kentaro Fukui, NiharTrivedi	International Business Machines Corporation 2005
3	High Performance Cluster Computing: Architectures and Systems, Volume 1	R. Buyya	Pearson Education, 2008

REFERENCE BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Parallel computing theory and practice	Michel J. Quinn	TMH
2	Computer Architecture & Parallel Processing	Kai Hwang & Briggs	McGraw Hill
3	Parallel and Distributed Systems	Arun Kulkarni, Napur Prasad Giri	Wiley Publications, 2nd Edition

9. Web Technology (PCC- DS809)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs./Week (3 Credits)	**Theory** : --
Tutorial :	**Term work: 50 Marks**
Practical : 2 Hr. /Week (1 Credit)	**Practical : 50 Marks**

Pre-requisites: Object oriented Programming, Basics of HTML and CSS

Course Objectives

1. Introduce students with front end web designing.

2. Motivate the students to develop web applications using PHP.

3. To introduce emerging Web technology concepts and tools.

4. To learn database access technologies and state management techniques.

5. To expose students to XAMPP web services.

Course Outcomes

Upon successful completion of this course, the students will be able to:

1. Apply knowledge of client side scripting.

2. Develop web application using PHP.

3. Design web application using MVC and Angular JS.

4. Demonstrate use of server side technologies.

5. Explore newer tools for web development.

Unit No	Unit Name and Details	No of Lectures
1	**Front End Web Designing HTML and CSS**: HTML Design Patterns: HTML Structure, XHTML, DOCTYPE, Header Elements, Conditional Style Sheet, Structural Block Elements, Terminal Block Elements, Multipurpose Block Elements, Inline Elements, Class and ID Attributes, HTML Whitespaces CSS Selector and Inheritance: Type, Class and ID Selector, Position and Group Selectors, Attribute Selectors, Pseudo-element Selectors, Pseudo-class Selectors, Subclass Selector, Inheritance, Visual Inheritance, and Bootstrap	5
2	**Javascript Basics**: Introduction to javascript, Basic program of javascript, variables, functions, conditions, loops and repetition, Function, Arrays – DOM, Built-in Objects, Regular Expression, Exceptions, Event handling In Javascript, Validating HTML form data using javascript, Validation- AJAX - JQuery	6
3	**Angular Node JS:** Angular - Web Application architecture, MVC and MVVM design pattern, Angular architecture, Angular building blocks, Forms implementation, Filters, Services, Consuming REST Web Services, Modules: Built-in and custom, Directives: Built-in and custom, Routing and Navigation, Animations, Testing Angular application. Node, NodeJs architecture ,Modules: Built-in and custom, Event loop, Asynchronous application , Events, Listeners, Timers, and Callbacks in Node.js. Testing node application. Introduction to Mongo DB- Accessing MongoDB from Node.js.	6
4	**PHP basic:** PHP Basics: Embedding PHP code in Your Web Pages, Commenting Your Code, Outputting Data to the Browser, PHP supported Data Types, Identifiers, Variables, Constants, Expressions, String Interpolation, and Control Structures Functions: Invoking a Function, Creating a Function, Function Libraries Array: What is Array?, Creating an array, outputting an Array, Merging, slicing, splicing and Dissecting Arrays, Other useful Array, Functions.	7
5	**PHP session management (state management):** Session Handlers: What Is Session Handling, Configuration Directives, Working with Sessions, Practical Session-Handling Examples, Creating Custom Session Handlers, PHP cookies, Uploading Files with PHP	6
6	**PHP Database and small app using Laravel and Code to generate**: Installation Prerequisites, Using the MySqli Extension, Interacting with the Database, Executing Database Transactions.	6

Term Work

- Minimum of 15 Experiments to be performed from the list given below.

- 25 marks for performance in practical and experiments as part of continuous evaluation

- 25 marks for Practical Test and oral to be conducted.

Experiment List

1. Create html pages for website like login, registration and about us pages.

2. Apply and design the created HTML pages using CSS

3. Write a program demonstrating javascript functions and different validations.

4. Write a program to read and write HTML contents with JQuery.

5. Create a simple Testing Angular application.

6. Write a program demonstrating NodeJs application.

7. Write a program to handle the error in NodeJs..

8. Write a study experiment for Installing Apache and PHP on Linux, Configuring PHP at Build Time onLinux. Or Installation of XAMPP.

9. Hello world Program-Embedded HTML with PHP.

10. Program based on PHP variables, Expression, arrays, control structure.

11. Experiment Based on OOP and Advance OOP PHP

12. Form validation using PHP using regular expressions

13. Upload various types of file from client side to server with validation

14. Write a program to create and handle a session, cookie in PHP

15. Insert user entered data in form to MySQL database using PHP

16. Update user's data stored in MySQL database using PHP

17. Write a program to manage session in PHP having login facility in any web application

18. Write a program to show stored cookies, update, retrieve and delete from browser.

TEXT BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Pro HTML5 and CSS3 Design Patterns	Michael Bowers, DionysiosSynodinos and Victor Sumner	Apress edition
2	Beginning PHP and MySQL: From Novice to Professional	W. Jason Gilmore	Fourth Edition
3	MEAN Web Development	Amos Q. Haviv	PACKT PUBLISHING LTD

REFERENCE BOOKS

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Web Development With Node and Express	Ethan Brown	Published by O'Reilly Media

10. Project -II (PW- DS810)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : --	Theory : --
Tutorial : -	Term work: 50 Marks
Practical : 4 Hr. /Week (2 Credit)	Practical : 50 Marks

Pre-requisites: Project I ,Software Engineering, Mini Project.

Course Objectives

1. Students should learn to design and develop usable User Interface

2. Students should learn to analyze and apply emerging technologies in development of a

project

3. Students should learn to test the modules in Project

4. Students should learn to demonstrate working of project

Course Outcomes

Upon successful completion of this course, the students will be able to:

1. Design and develop usable User Interface

2. Analyze and apply emerging technologies in development of a project

3. Test the modules in Project

4. Demonstrate working of project

Contents

The group will continue to work on the project selected during the semester VII and submit the completed Project work to the department at the end of semester VIII as mentioned below.

1. The workable project.

2. The project report in the bound journal complete in all respect with the following : -

i. Problem specifications

ii. System definition – requirement analysis.

iii. System design – dataflow diagrams, database design

iv. System implementation – algorithm, code documentation

v. Test results and test report.

vi. In case of object oriented approach – appropriate process be followed.

CIE will be jointly assessed by a panel of teachers appointed by head of the Institution. SEE examination will be conducted by internal and external examiners

Note:

1. Project work should be continually evaluated based on the contributions of the group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability, etc.

2. Two mid-term evaluations should be done, which includes presentations and demos of the work done.

3. Care should be taken to avoid copying and outsourcing of the project work

10. Professional Skills (HM- DS811)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : --	Theory : --
Tutorial : - 2 Hr. /Week (1 Credit)	Term work: 50 Marks
Practical :	Practical :

Pre-requisites: Effective English Communication, Report Writing Skills, Technical Skills.

Course Objectives

1. To increase one's knowledge and awareness of emotional competency and emotional intelligence at place of study/work.

2. To develop interpersonal skills and adopt good leadership behavior for empowerment of self and others.

3. To set appropriate goals, manage stress and time effectively.

Course Outcomes

At the end of the program learners will be able to:

1. Recognize own strengths and opportunities.

2. Apply the life skills to different situations.

3. Speak fluently in academic and social contexts.

4. Develop Critical thinking and innovative skills.

Syllabus

I. E-Learning Course

Students are supposed to complete e-learning course from any online platforms like
MOOCS/NPTEL/Swayam/Coursera/Udemy etc. related to Project work or advanced
technologies. Duration of the Course should be minimum 4 weeks.

At the end of course students are advised to attend the exam and get the certificate for the same.

II. Professional Skills: Career Skills

1. Resume Skills

2. Interview Skills / Online Interview

3. Group Discussion Skills

4. Exploring Career Opportunities

III. Professional Skills: Team Skills

1. Presentation Skills

2. Trust and Collaboration

3. Brainstorming

4. Social and Cultural Etiquettes

5. Internal Communication

6. Social Media Profile Building

IV. Leadership and Management Skills

1. Leadership Skills

2. Managerial Skills

3. Time Management

4. Entrepreneurial Skills

5. Innovative Leadership and Design Thinking

6. Ethics and Integrity

V. Introduction to Critical Life skills

Leadership, teamwork, dealing with ambiguity, managing stress, motivating people, creativity,
result orientation; Understanding Life Skills: Movie based learning, Self-awareness- identity,
body awareness, stress management; building self-confidence; Importance of listening skills,
Difference between listening and hearing, Types of listening.

Term Work

1. Students are expected to learn new application areas, enhance technical skills, and build their
profile by completing E-Learning Course.

2. Prepare their resume in an appropriate template without grammatical and other errors and

using proper syntax.

3. Participate in a simulated interview.

4. Actively participate in group discussions towards gainful employment.

5. Capture a self - interview simulation video regarding the job role concerned.

6. Enlist the common errors generally made by candidates in an interview.

7. Perform appropriately and effectively in group discussions.

8. Explore sources (online/offline) of career opportunities.

9. Identify career opportunities in consideration of their own potential and aspirations.

10. Use the necessary components required to prepare for a career in an identified occupation (As a case study).

Based on above activities respective guide should assess the performance of the students out of 50 marks.

Learning Resources

Text Books

1. Lewis Lansford and Peter Astley. Oxford English for Careers: Engineering 1: Student's Book.2013. USA: Oxford University Press.

2. Jaimie Scanlon. Q: Skills for Success 1 Listening & Speaking. 2015. [Second Revised Edition]. Oxford: Oxford University Press.

Reference Books:

1. Sanjay Kumar and Puspalata. Communication Skills. 2015. [Second Edition] Print. New Delhi: Oxford University Press.

2. John Seely. Oxford Guide to Effective Writing and Speaking. 2013. [Third Edition].New Delhi: Oxford University Press.

3. Meenakshi Raman. Communication Skills. 2011. [Second Edition]. New Delhi: Oxford University Press.

4. Terry O'Brien. Effective Speaking Skills. 2011. New Delhi: Rupa Publishers.

5. BarunMitra. Effective Technical Communication: AGuide for Scientists and Engineers. 2015.New Delhi: Oxford University Press.

6. English vocabulary in use – Alan Mc'carthy and O'dell

7. APAART: Speak Well 1 (English Language and Communication)

8. APAART: Speak Well 2 (Soft Skills)

9. Business Communication – Dr.Saroj Hiremath

Web References:

1 Train your mind to perform under pressure- Simon sinek

https://curiosity.com/videos/simon-sinek-on-training-your-mind-to-perform-underpressure-captureyour-flag/

2 Brilliant way one CEO rallied his team in the middle of layoffs

https://www.inc.com/video/simon-sinek-explains-why-you-should-put-people-beforenumbers.html

3 Will Smith's Top Ten rules for success

https://www.youtube.com/watch?v=bBsT9omTeh0

Online Resources:

1 https://www.coursera.org/learn/learning-how-to-learn

2 https://www.coursera.org/specializations/effective-business-communication