



SHIVAJI UNIVERSITY KOLHAPUR

**REVISED SYLLABUS AND STRUCTURE
FINAL YEAR (FINAL YEAR B. Tech) BACHELOR OF
TECHNOLOGY**

IN

Computer Science and Engineering

To be introduced from the academic year 2021-22

(w.e.f. June 2021) onwards

FINAL YEAR COMPUTER SCIENCE AND ENGINEERING - CBCS PATTERN																
SEMESTER - VII																
Sr. No.	Course Subject / Title	TEACHING SCHEME							EXAMINATION SCHEME							
		THEORY			TUTORIAL		PRACTICAL		THEORY				ORAL / PRACTICAL		TERMWORK	
		Credits	No. Of Lectures	Hours	Credits	No. of Hours	Credits	No. of Hours	mode	marks	Total Marks	MIN.	MAX	MIN.	MAX	MIN.
1	PCC-CS701 Advanced Computer Architecture	4	4	4	1	1			CIE	30	100	40			25	10
									ESE	70						
2	PCC- CS702 Cloud Computing	3	3	3			1	2	CIE	30	100	40			25	10
									ESE	70						
3	PCC- CS703 Advanced Database Systems	3	3	3			1	2	CIE	30	100	40	50	20	25	10
									ESE	70						
4	PCE- CS704 Elective-I	3	3	3	1	1			CIE	30	100	40			25	10
									ESE	70						
5	PCC- CS705 Web Technologies	3	3	3			2	4					50	20	50	20
6	PW- CS706 Project – I						2	4					50	20	50	20
7	SI-CS707 Internship						1								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								
Sr. No.	Course Subject / Title	THEORY			TUTORIAL		PRACTICAL		THEORY				ORAL / PRACTICAL		TERMWORK		
		Credits	No. Of Lectures	No. of Hours	Credits	No. of Hours	Credits	No. of Hours	mode	marks	Total Marks	MIN.	MAX	MIN.	MAX	MIN.	
1	PCC- CS801 Big Data Analytics	4	4	4			1	2	CIE	30	100	40	50	20	25	10	
									ESE	70							
2	PCC- CS802 Deep Learning	3	3	3	1	1			CIE	30	100	40			25	10	
									ESE	70							
3	PCE- CS803 Elective-II	3	3	3	1	1			CIE	30	100	40			25	10	
									ESE	70							
4	PCE- CS804 Elective-III	3	3	3	1	1			CIE	30	100	40			25	10	
									ESE	70							
5	PCC- CS805 Mobile Application Development	3	3	3			2	4					50	20	50	20	
6	PW- CS806 Project – II						2	4					50	20	50	20	
7	HM-CS807 Professional Skills				1	1									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-CS:** Professional Core Course – Computer Science and Engineering are compulsory.
2. **PCE-CS:** Professional Core Elective – Computer Science and Engineering are compulsory
3. **HM-CS:** Humanities and Management- Computer Science and Engineering are compulsory.
4. **PW-CS:** Domain Specific Mini Project — Computer Science and Engineering are compulsory.
5. **SI-CS:** Internship-Computer Science and Engineering are compulsory.

Professional Core Elective – I

1. Artificial Intelligence
2. Software Testing & Quality Assurance
3. Image Processing

Professional Core Elective – II

1. Project Management
2. Natural Language Processing
3. Ad-Hoc Wireless Sensor Networks

Professional Core Elective – III

1. High Performance Computing
2. Blockchain Technologies
3. Human computer Interaction

Final Year B. Tech (Computer Science and Engineering)

Semester-VII

1. Advanced Computer Architecture (PCC-CS701)

TEACHING SCHEME	EXAMINATION SCHEME
Theory :4 Hrs./Week	Theory : ESE 70 Marks CIE 30 Marks
Tutorial :1 Hrs./Week	Term work: 25 Marks
Practical :- NA	Practical :NA

Pre-requisites: Digital systems and microprocessors, computer organization and architectures.

Course Objectives

1. To make students know about the Parallelism concepts in Programming
2. To give the students an elaborate idea about the different memory systems and buses.
3. To introduce the advanced processor architectures to the students.
4. To make the students know about the importance of multiprocessor and multi- computers.
5. To study about data flow computer architectures

Course Outcomes

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

1. Demonstrate concepts of parallelism in hardware/software.
2. Discuss memory organization and mapping techniques.
3. Describe architectural features of advanced processors.
4. Interpret performance of different pipelined processors.
5. Explain data flow in arithmetic algorithms.
6. Development of software to solve computationally intensive problems.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	The Concept of Computer Architecture and Fundamentals of Quantitative Design and Analysis: <ul style="list-style-type: none"> a) Parallel Processing Mechanisms b) Parallel Computer Structures: Pipeline Computers c) Array Processors d) Multiprocessor Systems e) Architectural classification Schemes: Multiplicity of Instruction-Data Streams f) Trends in power and energy in Integrated Circuits g) Trends in Cost h) Dependability 	7
2.	Principles of Pipeline: <ul style="list-style-type: none"> a) Principles of linear pipeline b) Classification of Pipelined Processors c) Interleaved memory organization d) Hazard detection and resolution e) Basic compiler Techniques for Exposing ILP 	6
3.	Memory Hierarchy Design : <ul style="list-style-type: none"> a) Introduction b) Ten Advanced optimizations of cache performance 	5
4.	Data Level Parallelism in Vector, SIMD and GPU Architecture: <ul style="list-style-type: none"> a) Vector Processing requirement: Characteristics of vector processing b) Multiple vector Task dispatching c) Pipelined vector processing methods d) Associative Array Processing: Associative Memory Organization e) Associative processors (PEPE and STARAN) f) Data Level Parallel in Vector :Introduction g) Vector Architecture 	7
5.	Data Level Parallelism in SIMD and GPU Architecture: <ul style="list-style-type: none"> a) SIMD ARRAY PROCESSORS: SIMD Computer organization b) Masking and Data Routing Mechanism c) SIMD Instruction set extension for Multimedia d) Graphics Processing Units : Programming the GPU e) NVIDIA GPU Computational structures f) NVIDIA GPU Instruction set Architecture g) Conditional Branching in GPU h) NVIDIA GPU Memory Structure 	7

6.	Multiprocessor Architecture : a) Introduction b) Multiprocessor Architecture: Issus and Approach c) Challenges of parallel processing d) Centralized shared memory Architecture: Multiprocessors Cache coherence e) Basic schemes for enforcing coherence f) Snooping Coherence Protocols g) Distributed shared memory and directory based coherence h) Directory Based cache coherence protocol :The basics	7	
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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	Units Covered
1	Computer architecture and Parallel Processing	Kai Hwang and Faye A Briggs	Tata McGraw-Hill	Unit No 01: a) 1.2.2 b) 1.3.1 c)1.3.2 d)1.3.3 e) 1.4.1 Unit No:02 : a)3.1.1 b)3.1.2 c)3.1.4 d)3.3.4 Unit No:04 : a) 3.41 b)3.4.2 c)3.4.3 d)5.4 e)5.4.2 Unit No:05 a)5.1.1 b)5.1.2
2	Computer Architecture: A Quantitative Approach	John L. Hennessy and Davd A. Patterson	Morgan Kaufmann	Unit No 01: f)1.5 g)1.6 h) 1.7 Unit No 02 : f) 3.2 Unit No 03: a)2.1 b)2.2 Unit No:04 : f)4.1 g)4.2 Unit No:05 : c) 4.3 d)4.4 e)4.4 f)4.4 Unit No:06 : Chapter 5

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Advanced computer Architecture	DezsoSima, Terence Fountain & Peter Kacsuk	Pearson Education
2	Parallel Programming Techniques & Applications using Networked Workstations &Parallel Computers	Barry Wilkinson & Michael Allen	Pearson Education
3	Advanced Computer Architecture	Kai Hwang & NareshJotwani	McGraw Hill Publications

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2. Cloud Computing (PCC – CS702)

TEACHING SCHEME	EXAMINATION SCHEME
Theory :3 Hrs./Week	Theory : ESE 70 Marks CIE 30 Marks
Tutorial : NA	Term work: 25 Marks
Practical : 2 Hrs./Week	Practical :NA

Pre-requisites: Operating Systems, Fundamentals of Computer Networks.

Course Objectives

1. To become familiar with Cloud Computing and its ecosystem.
2. To learn basics of virtualization and its importance.
3. To evaluate in-depth analysis of Cloud Computing capabilities.
4. To give technical overview of Cloud Programming and Services.
5. To understand security issues in cloud computing.

Course Outcomes

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

1. Describe the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing.
2. Explain the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
3. Collaboratively research on the state of the art (and open problems) in cloud computing.
4. Identify problems, and explain, analyze, and evaluate various cloud computing solutions.
5. Choose the appropriate technologies, algorithms, and approaches for the related issues.
6. Display new ideas and innovations in cloud computing.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	Overview of computing paradigm: Recent trends in Computing - Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing. Evolution of cloud computing - Business driver for adopting cloud computing. Introduction to Cloud Computing: Cloud Computing - Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers. Properties, Characteristics&	5

		Disadvantages - Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing. Role of Open Standards.	
	2.	Cloud Computing Architecture: Cloud computing stack - Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services. Service Models (XaaS) - Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS). Deployment Models, Public cloud, Privatecloud, Hybrid cloud, Community cloud	6
	3.	Virtualization: Introduction and benefits, Implementation Levels of Virtualization, Virtualization at the 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
	4.	Infrastructure as a Service (IaaS): Introduction to IaaS - IaaS definition, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine (VM). Resource Virtualization - Server, Storage, Network. Virtual Machine(resource) provisioning and manageability, storage as a service, Data storage incload computing (storage as a service). Renting, EC2 Compute Unit, Platform and Storage, pricing, customers. Platform as a Service (PaaS): Introduction to PaaS - What is PaaS, Service Oriented Architecture (SOA). Cloud Platform and Management - computation, storage Software as a Service (SaaS): Introduction to SaaS, Web services, Web 2.0, Web OS, Case Study on SaaS	6
	5.	Service Management in Cloud Computing: Service Level Agreements (SLAs), Billing& Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously, Managing Data - Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud, Large Scale Data Processing Cloud Security: Infrastructure Security - Network level security, Host level security, Application-level security. Data security and Storage - Data privacy and security Issues, Jurisdictional issues raised by Data location: Identity & Access Management, Access Control, Trust, Reputation, Risk, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations	7
	6.	Case study on Open Source and Commercial Clouds – Amazon EC2, Google Compute Engine, Microsoft Azure, Cloud foundry, OpenStack	5

Term Work

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

Experiment List

1. Working and Implementation of Infrastructure as a service.
2. Working and Implementation of Software as a service.
3. Working and Implementation of Platform as a services.
4. Practical Implementation of Storage as a Service.
5. Installing a private cloud.
6. Installing OS on a Virtual Machine Monitor.
7. Offline migration of virtual OS.
8. Live migration of virtual OS.
9. Study and implementation of infrastructure as Service using Open Stack.
10. Assignment to install and configure Google App Engine.
11. Hands on virtualization using Xen Server.
12. Hands on containerisation using Docker.
13. Deployment and Configuration options in Amazon (AWS).
14. Deployment and Configuration options in Google Cloud.
15. Deployment and Configuration options in Microsoft Azure.
16. Building a 'HelloWorld' app for the cloud.
17. Deploying the 'HelloWorld' app for the cloud.
18. Case study on Amazon EC2 to learn about Amazon EC2, Amazon Elastic Compute Cloud is a central part of Amazon.com's cloud computing platform, Amazon Web Services. How EC2 allows users torrent virtual computers on which to run their own computer applications.

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Cloud Computing for Dummies	Judith Hurwitz, R. Bloor, M.Kanfman, F.Halper	WileyIndia Edition	Unit - I, II, IV, V
2	Cloud Computing Black Book	Jayaswal, Kallakurchi, Houde, Shah	DreamtechPress	Unit-III
3	Cloud Security	Ronald Krutz and Russell Dean Vines	Wiley-India	Unit-V
4	Enterprise Cloud Computing	GautamShroff	Cambridge	Unit -VI

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Google Apps	Scott Granneman	Pearson
2	Cloud Security & Privacy	Tim Mather, S.Kumaraswamy, S.Latif	SPD, O'REILLY
3	Cloud Computing: A Practical Approach	Anthony T.Velte, et.al	McGraw Hill
4	Cloud Computing: Principles and Paradigms	Rajkumar Buyya, James Broberg, Andrzej Goscinski	Wiley India
5	Cloud Computing for Dummies	Judith Hurwitz, Marcia Kaufman, Fern Halper, Robin Bloor	Wiley Publication
6	Cloud Computing Bible	Barrie Sosinsky	Wiley India
7	Cloud Computing	Michael Miller	Que Publishing

Final Year B. Tech (Computer Science and Engineering) Sem- VII

3. Advanced Database Systems (PCC- CS703)

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

Pre-requisites: -

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 complex SQL scripts.
5. Learn database administration tasks and security measures.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	Section - I 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,	8

		Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control, Distributed Query Processing, Case Studies-Distributed Databases in Oracle.	
2.	Unit II: Advanced SQL Relational Set Operators, SQL Join Operators, Subqueries and Correlated Queries, 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.	7	
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.	9	
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.	8	
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.	8	
6.	Unit VI: Data analysis and exploration Mathematical models for decision making, data mining, data preparation, data exploration. Data mining tasks - association rules.	8	

Term Work

- Minimum 10- 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 social networking 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 data modeling 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 operations in 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 –
 - i) Installing and upgrading the database server and/or application tools.
 - ii) Creating user's profiles and ensuring system security by careful allocation of user permissions.
 - iii) 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 distributed database 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 and Management	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, Johannes Gehrke,	MGH, [4e], 2015
2	Fundamentals of Database Systems	R. Elmasri S. B. Navathe,	Addison Wesley, 2015
3	NoSQL Distilled: A brief guide to merging world of Polyglot persistence,	Pramod J. Sadalage and Marin Fowler	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.

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4. Artificial Intelligence (PCE– CS704) Elective-I

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: 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 & 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.	7

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	9
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, LearningDecision Trees. Expert Systems - Stages in the development of an Expert System - Probability based ExpertSystems - Expert System Tools - Difficulties in Developing Expert Systems - Applications ofExpert Systems.	9
5.	Reinforcement Learning: Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.	7
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.	9

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.
- 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

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Artificial Intelligence, 3rd edition	Ric, E., Knight, K and Shankar, B.	Tata McGraw Hill.2009
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

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5. Software Testing and Quality Assurance (PCE- CS704) Elective-I

TEACHING SCHEME	EXAMINATION SCHEME
Theory :3 Hrs./Week	Theory : ESE 70 Marks CIE 30 Marks
Tutorial : 1 Hrs/Week	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 & DETAILS	NO. OF LECTURES
1.	Introduction : Some Software Failures, Testing Process, Some Terminologies, Limitations of Testing, The V Shaped software life cycle model	4
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,	8

	strategies for data validity, Database testing	
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	7
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 Tools,	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.	5
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	6

Term Work

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

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	Units Covered
1	Software testing:	Yogesh Singh,	Cambridge University Press, First Edition	Unit-I,II,III,VI
2	Effective Methods for Software Testing (Chapter 4, 6, 7, 8, 9, 10)	William E. Perry,	Third edition, Wiley India, 2009	Unit –IV,V
3	Software Testing – Principles and Practices (Chapter 12)	Naresh Chauhan,	Oxford University Press, 2010	Unit –IV

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
3	Software Quality, Mordechai	Ben Menachem, Garry S. Marliss,	BS Publications

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6. Image Processing (PCE – CS704) Elective-I

TEACHING SCHEME	EXAMINATION SCHEME
Theory :3 Hrs./Week	Theory : ESE 70 Marks CIE 30 Marks
Tutorial : 1 Hrs./Week	Term work: 25 Marks
Practical :	Practical : –

Pre-requisites:

Course Objectives

1. To learn the fundamental concepts of Digital Image Processing
2. To study basic image processing operations.
3. To cover the basic analytical methods which are widely used in image processing.

Course Outcomes

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

1. Describe the basic issues and the scope of image processing, and the roles of image processing and systems in a variety of applications.
2. Explore different techniques in image acquisition and color transformation
3. Understand how digital images are represented
4. Evaluate the mathematical principles of digital image enhancement
5. Explore and apply the concepts of Edge detection, segmentation and object recognition

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	Introduction Concept of Digital Image Processing, Steps in Image Processing, Components of Image Processing System, Applications areas, Image representation, Grey scale and color images.	6
2.	Image Enhancement and Processing : Basic Grey level transformation, Histogram Processing techniques, Color Fundamentals, color models, Pseudo color image processing.	7
3.	Image Restoring and Reconstruction: Noise models, Noise Reduction, Inverse filtering, MMSE filtering.	5
4.	Image Compression : Fundamental of Redundancies, Basic Compression Methods, Huffman coding, Arithmetic coding, LZW coding, JPEG	5

	compression, Standard.	
5.	Image Segmentation: Detection of Discontinuities, Point, Line and Edge detection, Thresholding, Region based Segmentation.	6
6.	Image Processing Applications: Biometric Pattern Recognition, Face Recognition. Preprocessing of Signature Patterns, Lung Disease Identification.	7

Term Work

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

Text Books

Sr. No.	Title	Author(s) Name	Publication & Edition	Units Covered
1	Digital Image Processing	R.C.Gonzalez and R.E.Woods	Pearson Edition	1 to 6

Reference Books

Sr. No.	Title	Author(s) Name	Publication & Edition
1	Digital Image Processing	A.K.Jain	PHL
2	Image processing, Analysis and Machine vision	M.Sonka, V.Hlavac, and R.Boyle	Thomson Asia pvt. Ltd

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7. WEB TECHNOLOGIES (PCC- CS705)

TEACHING SCHEME	EXAMINATION SCHEME
Theory :3 Hrs./Week	Theory : NA
Tutorial :NA	Term work: 50 Marks
Practical : 4 Hrs./Week	POE : 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 & 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	6

	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	7	
	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, NodeJsarchitecture ,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.	5	
	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.	5	
	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 MySql Extension, Interacting with the Database, Executing Database Transactions.	7	

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 on Linux. 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	Units Covered
1	Pro HTML5 and CSS3 Design Patterns	Michael Bowers, DionysiosSynodinos and Victor Sumner	Apress edition	(Unit I & II)
2	Beginning PHP and MySQL: From Novice to Professional	W. Jason Gilmore	Fourth Edition	Unit IV to VI
3	MEAN Web Development	Amos Q. Haviv	PACKT PUBLISHING LTD	Unit III

Reference 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	Web Development withNode and Express	Ethan Brown	Published by O'Reilly Media
3	http://www.php.net	Open Source	online

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8. Project-I (PW- CS706)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : NA	Theory : NA
Tutorial : NA	Term work: 50 Marks
Practical : 4 Hrs./Week	Demo & OE: 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.**

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9. Internship (SI-CS707)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : NA	Practical:1 Credit
Tutorial :NA	Term work: 50 Marks
Practical :Minimum4 Weeks duration	Mode of Evaluation : –Internship Report, Presentation and Project Review.

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).