Walchand Institute of Technology, Solapur
(An Autonomous Institute)

Affiliated to
Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Choice Based Credit System (CBCS)

Structure and Syllabus
for
B.Tech. Computer Science and Engineering
W.E.F. 2025-26

HEAD
Computer Science and Engineering
Walchand Institute of Technology
Solapur -413006.

Dr. Mrs. M. A. Nirgude
Dean Academics

WALCHAND INSTITUTE OF TECHNOLOGY WIT SOLAPUR (Autonomous)

Computer Science and Engineering

Vision

To develop professional engineers in Computer Science & Engineering having ethical values, research aptitude and ability to address challenges of modernization in the IT industry aiming at overall sustainable development of the society.

Mission

- M1 - To impart quality education in the field of Computer Science & Engineering in accordance with the needs of the Modernization & Globalization through technology enabled education.
- M2 - To inculcate lifelong learning in students to face challenges posed by ever-changing IT career landscape as a disciplined professional with a sense of professional ethics.
- M3 - To inculcate critical thinking and creativity for identifying various societal issues and to provide solutions.
- M4 - To enhance career opportunities for students through academia-industry interaction and research.

Computer Science and Engineering

Program Educational Objectives (PEOs)

1. Graduate will exhibit strong fundamental knowledge and technical skills in the field of Computer Science & Engineering to pursue successful professional career, higher studies and research.
2. Graduate will exhibit capabilities to understand and resolve various societal issues through their problem solving skills.
3. Graduate will be sensitive to ethical, societal and environmental issues as a software engineering professional and be committed to life-long learning.

Knowledge and Attitude Profile (WK)

WK1	A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
WK2	Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
WK3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
WK4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
WK5	Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
WK6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
WK7	Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
WK8	Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
WK9	Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Program Outcomes (POs)	
PO 1	**Engineering Knowledge**: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO 2	**Problem Analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO 3	**Design/Development of Solutions**: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO 4	**Conduct Investigations of Complex Problems**: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
PO 5	**Engineering Tool Usage**: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO 6	**The Engineer and The World**: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO 7	**Ethics**: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO 8	**Individual and Collaborative Team work**: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO 9	**Communication**: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning difference
PO 10	**Project Management and Finance**: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO 11	**Life-long Learning**: Recognize the need for, and have the preparation and

	ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Specific Outcomes (PSOs)

1. Apply the principles of computational mathematics, computer systems and programming paradigms to solve computational problems.
2. Design and develop application software with functionalities applicable for desktop, web and mobile applications with due consideration of system software constraints.
3. Apply software engineering methods, cutting edge technologies and ICT, using appropriate tools and FOSS alternatives for designing ,developing & testing application software.

Computer Science and Engineering Department

Legends Used	
L	Lecture Hours / week
T	Tutorial Hours / week
P	Practical Hours / week
FA	Formative Assessment
SA	Summative Assessment
ESE	End Semester Examination
ISE	In Semester Evaluation
ICA	Internal Continuous Assessment
POE	Practical and Oral Exam
OE	Oral Exam
MOOC	Massive Open Online Course
HSS	Humanity and Social Science
NPTEL	National Programme on Technology Enhanced Learning
F.Y.	First Year
S.Y.	Second Year
T.Y.	Third Year
B. Tech.	Bachelor of Technology

Computer Science and Engineering

Course Code Format

2	**1**	**I**	**T**	**U/P**	**2**	**C**	**C**	**1**	**T/L**
Year of Syllabus revision		Program Code		U-Under Graduate P-Post Graduate	Semester No./ Year1/2/3/…8	CourseType		Course Serial No 1-9	T-Theory, L-Lab session P- Programming

Program Code	
CS	Computer Science and Engineering
Course Type	
BS	Basic Science
ES	Engineering Science
HU	Humanities & Social Science
MC	Mandatory Course
CC	Core Compulsory Course
SN*	Self-Learning **N*** *indicates the serial number of electives offered in the respective category*
EN*	Core Elective **N*** *indicates the serial number of electives offered in the respective category*
ON*	Open Elective **N*** *indicates the serial number of electives offered in the respective category*
SK	Skill Based Course
SM	Seminar
MP	Mini project
PR	Project
IN	Internship

Sample Course Code	
23CSU3CC1T	Discrete Mathematics Structures

Computer Science and Engineering

B. Tech. Semester VII

Course Code	Name of Course	Engagement Hours			Credits	FA		SA		Total
		L	T	P		ESE	POE	ISE	ICA	
22CSU7CC1T	Software Testing and Quality Assurance	3	--	--	3	60	--	40	--	100
22CSU7CC1A	Software Testing and Quality Assurance Tutorial	--	1	--	1	--	--	--	25	25
22CSU7CC2T	Distributed Systems	3	--	--	3	60	--	40	--	100
22CSU7EN*3T	Professional Elective-II	3	--	--	3	60	--	40	--	100
22CSU7EN*4T	Professional Elective-III	3	--	--	3	60	--	40	--	100
	Sub Total	**12**	**1**	**--**	**13**	**240**	**--**	**160**	**25**	**425**
Laboratory Courses										
22CSU7CC2L	Distributed Systems Lab	--	--	2	1	--	--	--	25	25
22CSU7EN*4L	Professional Elective-III Lab	--	--	2	1	--	--		25	25
22CSU7CC5P	DevOps	2	--	2	3	--	50	25	25	100
22CSU7PR6L	Project Phase-I	--	--	4	2	--	50	--	50	100
22CSU7IN7L	Vocational Training	--	--	--	2	--	--	--	50	50
	Subtotal	**2**	**--**	**10**	**9**	**--**	**100**	**25**	**175**	**300**
	Grand Total	**14**	**1**	**10**	**22**	**240**	**100**	**185**	**175**	**725**

Computer Science and Engineering

B. Tech. Semester VIII

Course Code	Name of Course	Engagement Hours			Credits	FA		SA		Total
		L	T	P		ESE	OE/ POE	ISE	ICA	
Laboratory Courses										
22CSU8PR1L	Project Phase II	--	--	4*	2	--	50	--	50	100
22CSU8IN1L	Internship II/On Job Training (OJT)	--	--	20*	10	--	100	--	100	200
	Total	--	--	24	**12**	--	**150**	--	**150**	**300**

Note:

- N*indicates the serial number of electives offered in the respective category
- ## indicates program code of offering Programme

Professional Elective II

Course Code	Course
22CSU7E13T	Data Mining
22CSU7E23T	Management Information System
22CSU7E33T	Business Intelligence

Professional Elective III

Course Code	Course
22CSU7E14T	Big Data Analytics
22CSU7E24T	Information Retrieval
22CSU7E34T	Mobile Computing

Note:

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining students exceeds 7, then a new batch shall be formed.
2. Vocational Training (evaluated at Final Year B.Tech Semester VII) of minimum 15 days shall be completed in any vacation after S.Y. B.Tech Semester IV but before Final Year B.Tech Semester VII& the report shall be submitted and evaluated in Final Year B.Tech. Semester VII.
3. Appropriate Professional Elective IV Subjects may be added when required.
4. Project group for Final Year B.Tech. (Computer Science and Engineering) Semester VIII shall not be of more than five students.
5. Internship II / On Job Training (OJT):

i. Students may complete an internship / On Job Training (OJT) of a minimum of two months duration at the industry during Final Year Sem VIII.
ii. The industry shall appoint a Supervisor to assess the performance of the student and share the same with the departmental supervisor for the fulfillment of ICA marks.
iii. The student shall prepare a report of the work completed at the industry duly endorsed by the industry Supervisor and submit the same as an Internship report.
iv. The ESE for Internship II / On Job Training (OJT) shall be conducted by the Departmental Supervisor in the presence of an external industry or academic expert.

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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B.Tech. (Computer Science and Engineering), Semester-VII

22CSU7CC1T - Software Testing and Quality Assurance

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hours/week	**ESE**	60 Marks
Tutorials	1 Hour/week	**ISE**	40 Marks
Credits	3	**ICA**	25 Marks

Course Objectives:

1. To describe knowledge of the software testing process and various methods of testing.
2. To describe generation and execution of test strategy & test plan.
3. To discover correctness, completeness and quality of software.
4. To implement automated testing tools to test software.

Course Outcomes:

At the end of this course, students will be able to
1. Compare the different software testing methods and select the suitable one for a given scenario.
2. Design test strategy & test plan for software testing.
3. Apply different approaches of quality assurance and standards for increasing quality of software.
4. Demonstrate automated testing tools to test software.

Unit – I	**Fundamentals of Software Testing**	**8 Hours**

Introduction, Basics of Software Testing, Approaches to Testing, Testing During Development Life Cycle, Essential of Software Testing, Features of Testing, Misconceptions About Testing, Principles of Software Testing, Test Policy, Strategy, Planning, Process, Challenges in Testing, Test Team Approach, Methods, Defect Classification, Defect, Error, Mistake in Software, Defect Life Cycle, Defect Management Process, Developing Test Strategy, Developing Testing Methodologies, Test Methodologies, Skills Required by Tester.

Unit – II	**Methods of Testing**	**6 Hours**

Software Verification and Validation, Black-Box and White-Box Testing, Static and Dynamic Testing, Black-Box Testing Techniques-Equivalence Partitioning, Data Testing, State Testing, Other Black Box Test Techniques. White-Box Testing Techniques-Data Coverage, Code Coverage, Other White Box Test Techniques.

Unit – III	**Levels of Testing**	**8 Hours**

Verification and Validation Model, Levels of Testing, Proposal Testing, Requirement Testing, Design Testing, Code Review, Unit Testing, Module Testing, Integration Testing, Big-Bang Testing, Sandwich Testing, System Testing- GUI Testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Load Testing, Installation Testing, Regression Testing, Smoke Testing, Sanity Testing, Ad hoc Testing, Usability Testing, Acceptance Testing-Alpha Testing, Beta Testing, Gamma Testing.

Unit – IV	**Test Planning & Documentation**	**8 Hours**

Test Planning-The goal of Test Planning, Test Planning Topics, Writing and Tracking Test Cases-The Goal of Test Case Planning, Overview, Test Case Organization and Tracking, Reporting Bugs-

Getting Your Bugs Fixed, Isolating and Reproducing Bugs, Bug-Tracking Systems.		
Unit – V	**Quality Concepts & Software Quality Assurance**	**8 Hours**
Quality Concepts-What is Quality?, Software Quality, The Software Quality Dilemma,Achieving Software Quality, Elements of Software Quality Assurance, SQA Processes and Product Characteristics, SQA Tasks, Statistical SQA, Software Reliability, The ISO 9000 Quality Standards, CMM, The SQA Plan.		
Unit – VI	**Automated Testing and Testing Tools**	**6 Hours**
Introduction, The Benefits of Automation and Tools, Software Test Automation, Random Testing, Realities of Using Test Tools and Automation.		

Internal Continuous Assessment (ICA):

1. Introduction to Software Testing
2. Develop a comprehensive test plan for a simple application (e.g., login system or calculator).
3. Write Test Cases for a Login Page
4. Apply black-box techniques (boundary value analysis, equivalence partitioning) to a sample problem.
5. Write a basic automated test using Selenium WebDriver or Cypress.
6. Create a Selenium Script to Automate a Search Function
7. Use a tool like JMeter or LoadRunner to test the performance of a web application.
8. Write unit tests for given code snippets in Java, Python, or C# using JUnit, PyTest, or NUnit.
9. Identify regression test cases for a feature update in an existing application.
10. End-to-End Test Strategy for a Web application.

Text Books

1. Software Testing Principles, Techniques and Tools By M G Limaye, Published by Tata McGraw-Hill Education Private Limited, Published 2009, ISBN (13): 978-0-07-013990-9, ISBN (10): 0-07-013990-3 (Chapter 1 & 3)
2. Software Testing, Second Edition By: Ron Patton, Published by SAMS, ISBN-13: 978-0672327988 ISBN-10: 0672327988 (Chapter 2, 4 & 6)
3. Software Engineering: A Practitioner's Approach by Roger S Pressman, 8th Edition, Publisher McGraw Hill (Chapter 5)

Reference Books

1. Software Testing Principle and Practices By Ramesh Desikan, Gopalaswamy Ramesh, Pearson Education, ISBN 978-81-7758-121-8
2. Software Testing Principles and Practices By Naresh Chauhan, Publisher OXFORD UNIVERSITY PRESS-NEW DELHI, ISBN 0-19-806184-6
3. Beautiful Testing: Leading Professionals Reveal How They Improve Software By Adam Goucher, Tim Riley, Publisher O'reilly
4. Foundations of Software Testing By Rex Black, Dorothy Graham, Erik Van Veenendaal, Isabel Evans, Published by Cengage Learning India Pvt Ltd.
5. Lessons Learned in Software Testing by Cem Kaner, James Bach,Bret Pettichord, Publisher Wiley
6. Testing Computer Software Cem Kaner, Jack Falk, Hung Q. Nguyen, Publisher Wiley Selenium Testing Tools Cookbook By Unmesh Gundecha Published by Packt, ISBN: 978-1-84951-574-0
7. Dr. K.V.K.K. Prasad, "Software Testing Tools: Covering WinRunner, Silk Test, LoadRunner, JMeter and TestDirector With Case Studies", Dreamtech Publications, ISBN: 10:81-7722-532-4

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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B.Tech. (Computer Science and Engineering), Semester-VII

22CSU7CC2T: DISTRIBUTED SYSTEMS

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hours/week	**ESE**	60 Marks
Practical	2 Hours/week	**ISE**	40 Marks
Credits	4	**ICA**	25 Marks

Course Objectives:

1. To provide an Introduction to distributed Computing Systems, Distributed Operating systems and its design issues.
2. To describe various Communication techniques, message passing and Remote Procedure call mechanisms used for Inter process communication.
3. To discuss the synchronization issues such as Clock synchronization and mutual exclusion in distributed systems.
4. To study the issues and approaches for designing distributed file system.

Course Outcomes:

At the end of the course, student will be able to
1. Describe the basics of distributed systems and middleware.
2. Design and simulate distributed system software modules using various methods, strategies, and techniques presented in the course that fulfils requirements for desired properties.
3. Apply principles of distributed systems in a real world setting across multidisciplinary areas.
4. Apply knowledge of Hadoop Distributed File system, its architecture and working for active research at the forefront of these areas.

Unit – I	**Fundamentals**	**4 Hours**

Fundamentals of OS, What is Distributed System? Evolution of Distributed Computing System, Distributed Computing System Models, Distributed Computing Gaining Popularity, Issues in Designing Distributed System, Introduction to Distributed Computing Environment, Protocols for Distributed Systems – FLIP and VMTP

Unit – II	**Message Passing**	**6 Hours**

Introduction, Desirable features of Good Message-Passing System, Issues in IPC by Message Passing, Synchronization, Buffering, Message Passing Interface, Multi-datagram Messages, Process Addressing, Failure Handling, Group communication, Case Study: RMI, CORBA

Unit – III	**Remote Procedure Calls**	**6 Hours**

Introduction, The RPC Model, Transparency of RPC, Implementing RPC mechanism, Stub Generation, RPC Messages, Marshalling Arguments and Results, Server Management, Parameter-Passing Semantics, Call Semantics, Communication Protocols for RPCs, Client-Server Binding, Exception Handling, Security

Unit – IV	**Synchronization in Distributed Systems**	**6 Hours**

Introduction, Process Migration, Threads, Clock Synchronization, Event Ordering, Election algorithms, Distributed Consensus algorithms

Unit – V	**Distributed Mutual Exclusion**	**5 Hours**
Introduction, Classification of Mutual Exclusion Algorithms, Preliminaries, A simple solution to Distributed Mutual Exclusion, Non-Token-Based Algorithms, Lamport's Algorithm, The Ricart-Agrawala Algorithm, Token-Based Algorithms, Suzuki-Kasami's Broadcast Algorithms		
Unit – VI	**Distributed Deadlock Detection**	**5 Hours**
Introduction, Preliminaries, Deadlock handling strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control organizations for distributed deadlock detection, Centralized deadlock detection algorithms, Distributed deadlock detection algorithms, Avoidance and Prevention algorithms, Hierarchical deadlock detection algorithms		
Unit – VII	**Distributed File Systems**	**6 Hours**
Introduction, Architecture, Mechanisms for building Distributed File System, Design issues, Log-Structured file systems, Case studies- Google FS		
Unit – VIII	**Distributed Shared Memory**	**6 Hours**
Introduction, Architecture and Motivation, Algorithms for implementing DSM, Memory Coherence, Coherence Protocols, Design issues, Case studies-Linda		
Internal Continuous Assessment (ICA): Minimum 8 to 10 assignments on the following topics 1. Client-Server communication model. 2. Remote Procedure Call 3. Election Algorithm 4. Clock synchronization 5. Token and Non-token based algorithms for mutual exclusion. 6. Case Study of Google File System.		
Text Books		
1. Distributed O.S. Concepts and Design, P.K. Sinha, PHI (Unit 1, 2, 3, 4) 2. Advanced Concepts in Operating Systems, Mukesh Singhal & N.G. Shivaratri, TMH (Unit 5, 6, 7, 8) 3. Distributed Computing, Sunita Mahajan, Seema Shah, OXFORD University Press (Unit 1, Case studies 7, 8)		
Reference Books		
1. Distributed System Principles and Paradigms, Andrew S. Tanenbaum, 2nd edition, PHI Distributed Systems, Colouris, 3rd Edition		

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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B.Tech. (Computer Science and Engineering), Semester-VII

22CSU7E13T: Professional Elective II: DATA MINING

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hours/week	**ESE**	60 Marks
Credits	3	**ISE**	40 Marks

Course Objectives:

1. To provide a comprehensive understanding of different types of data suitable for mining in diverse application domains.
2. To equip students with essential data preprocessing and statistical techniques for transforming raw data into suitable formats for analysis.
3. To develop the ability to select and apply appropriate data mining algorithms for building intelligent analytical applications.
4. To foster understanding of how data mining is applied across various fields and to explore the practical use of different data mining techniques.
5. To enable implementation and evaluation of major data mining methods including classification, clustering, and association rule mining.

Course Outcomes:

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

1. Examine the types of the data to be mined for a particular application.
2. Apply preprocessing statistical methods for any given raw data.
3. Select and apply proper data mining algorithms to build analytical applications
4. Comprehend the roles that data mining plays in various fields and manipulate different data mining techniques.
5. Demonstrate and apply a wide range of Clustering, Classification and association rule mining algorithms.

Unit – I	**Introduction**	**3 Hours**

Why data Mining, What is Data Mining? Basic data mining tasks, What kind of Data can be mined, What kinds of Patterns can be mined?, technological support for data mining, target applications of data mining, major issues in data mining, KDD process ,Data mining Vs Knowledge Discovery in Databases.

Unit – II	**Data Preprocessing**	**3 Hours**

Need to Preprocess the data, major tasks in Data Preprocessing, Data Cleaning, Data integration, Data Reduction, Data Transformation and Data Dicretization.

Unit – III	**Mining Frequent Patterns, Associations, and Correlations: Basic and advanced Concepts**	**6 Hours**

Basic Concepts, Frequent Itemset Mining Methods, Which Patterns Are Interesting? – Pattern Evaluation Methods, Pattern Mining: A Road Map, Pattern Mining in Multilevel, Multidimensional Space, Constraint-Based Frequent Pattern Mining, Pattern Exploration and Application.

Unit – IV	**Classification**	**8 Hours**

Issues in Classification, Statistical-Based Algorithms: Regression, Bayesian Classifiers. Distance Based Algorithms: K -Nearest Neighbors Classifiers, Decision Tree Based Algorithms.		
Unit – V	**Cluster Analysis- Basic Concept and Methods**	**6 Hours**
Cluster Analysis: What is Cluster Analysis? Requirements for Cluster Analysis, Overview of Basic Clustering Methods, **Partitioning Methods**: k-Means, k-Medoids. **Hierarchical Methods**: Agglomerative Algorithms and Divisive Clustering, BIRCH: Multiphase Hierarchical Clustering Using Clustering Feature Trees, Evaluation of Clustering.		
Unit – VI	**Association Rules**	**6 Hours**
Introduction, Large Item sets, Basic Algorithms: Apriori Algorithm, Sampling Algorithm, Partitioning Algorithm, Parallel and Distributed Algorithms, Comparing Approaches, Incremental Rules, Advanced association rule-Techniques, Measuring the quality of rules.		
Unit – VII	**Web Mining**	**4 Hours**
Introduction, Web mining: Introduction, web content mining, web usage mining, web structure mining, web crawlers.		
Unit – VIII	**Outlier Detection**	**4 Hours**
Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Clustering-Based Approaches, Classification-Based Approaches.		
Text Books		
1. Margaret H. Dunham, “DATA MINING Introductory and Advanced Topics”, PEARSON (Units 4,6) 2. Han, Kamber, Pei, “DATA MINING Concept and Techniques”, 3rd Edition, ELSEVIER (Units 1,2,3,5,8) 3. Tan, Vipin Kumar, Steinbach, “Introduction to Data Mining” , PEARSON (Unit 3) 4. G. K. Gupta, Introduction to Data mining with case studies", PHI, second edition (Unit 7)		
Reference Books		
1. Galit Shmueli, Nitin Patel, Peter Bruce, “Data mining For Business intelligence” Wiley Student Edition. 2. M. Berry and G. Linoff, “Mastering Data Mining”, Wiley Student Edition		

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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B.Tech. (Computer Science and Engineering), Semester-VII

22CSU7E23T: Professional Elective II: Management Information Systems

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hours/week	**ESE**	60 Marks
Credits	3	**ISE**	40 Marks

Course Objectives:

1. Understand the role and impact of information systems in global business and organizational strategy.
2. Examine ethical, social issues of information systems and understand IT infrastructure trends.
3. Explore information systems security and understand e-commerce dynamics.

Course Outcomes:

At the end of this course, students will be able to
1. Identify how information systems transform business processes and competitive strategies.
2. Analyze ethical implications and evaluate IT infrastructure trends for business efficiency.
3. Develop strategies for information system security and understand e-commerce principles.

Unit – I	**Information Systems in Global Business Today**	**8 Hours**

The Role of Information Systems in Business Today, How information systems are transforming business, What is new in information system. Business Processes and Information systems, Systems for collaboration and social business, Tools and technologies for collaboration and social business

Unit – II	**Information Systems, Organizations, and Strategy**	**8 Hours**

Organizations and its features, How Information Systems Impact on Organizations, Competitive strategies using information systems, Challenges posed by strategic information systems

Unit – III	**Ethical and Social Issues in Information Systems**	**6 Hours**

Understanding Ethical, Social, political issues raised by information systems, principles for conduct in ethical decisions, Contemporary information systems technology. Challenges to the protection individual privacy and intellectual property.

Unit – IV	**IT Infrastructure and Emerging Technologies**	**8 Hours**

IT Infrastructure, Infrastructure Components, Contemporary Hardware Platform Trends, Contemporary Software Platform Trends, Management Issues, Organizing Data in a Traditional File Environment, Major Capabilities of Database Management Systems, Using Databases to Improve Business Performance and Decision Making, Managing Data Resources, Telecommunications, The Internet, and Wireless Technology: Principles Components of Telecommunications Network & Ket Networking Technologies, Different types of networks, Principle technologies and standards for wireless networking, communication Internet access.

Unit – V	**Securing Information Systems**	**7 Hours**

System Vulnerability and Abuse, Business Value of Security and Control, Organizational Framework for Security and Control, Technologies and Tools for safeguarding Information Resources		
Unit – VI	**E-commerce: Digital Markets, Digital Goods**	**8 Hours**
Features of e-commerce. Digital Markets, Digital Goods, principles ecommerce business and revenue models, e-commerce transformed marketing, e-commerce business-to-business transaction, Role of M-commerce in business & its applications, issues related building ecommerce.		
Text Books		
1. Management Information Systems: Managing the Digital Firm, 15th Edition by Kenneth C. Laudon and Jane Laudon, Pearson Education 2. Management Information Systems: Sashikala Parimi, Kogent Learning Solutions Inc.		
Reference Books		
1. Information Technology for Management: Transforming Organizations in the Digital Economy, Efraim Turban,6th Edition, Wiley Edition 2. Management Information Systems: Shubhalakshmi Joshi, Smita Vaze, Biztantra		

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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B.Tech. (Computer Science and Engineering), Semester-VII

22CSU7E33T: Profesional Elective II : BUSINESS INTELLIGENCE

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hours/week	**ESE**	60 Marks
Credits	3	**ISE**	40 Marks

Course Objectives:

1. To introduce BI environment with its architecture, applications and tools.
2. To make students to apply data mining techniques for data analysis.
3. To describe decision support system and BI tools.

Course Outcomes:

At the end of the course, student will be able to
1. Describe the basic components of BI environment.
2. Apply data mining techniques for data analysis.
3. Use ET Land BI tools for the decision support system.
4. Describe various applications of Business Intelligence

Unit – I	**Introduction to Business Intelligence**	**8 Hours**

Effective and timely decisions, role of mathematical models, BI architectures, ethics on BI. Introduction to data warehouse, architecture, OLAP

Unit – II	**Decision Support System**	**7 Hours**

Representation of decision making system, evolution of information system, definition and development of decision support system, mathematical models for decision making,

Unit – III	**Analysis of Data Mining**	**8 Hours**

Definition and applications of data mining, data mining process, analysis methodologies, data preparation, data validation, data transformation, data reduction, data exploration, Univariate analysis, Bivariate analysis, Multivariate analysis.

Unit – IV	**Machine learning and Data analysis**	**6 Hours**

Regression, simple and multiple regression, validation of regression models, time series, evaluating and analysis of time series, exponential smoothing models, autoregressive models

Unit – V	**Data mining Techniques for BI**	**8 Hours**

Classification and its problems, evaluating classification models, classification trees, Bayesian methods, neural Networks, structure of association rules, Apriori algorithm, general association rules, clustering methods, partition methods and hierarchical methods

Unit – VI	**Business Intelligence Applications**	**8 Hours**

Marketing models: Relational marketing, Sales force management, Business case studies, supply chain optimization, optimization models for logistics planning, revenue management system, Logistics business case studies
Text Books
1. Business Intelligence Data mining and optimization for Decision making by Carlo Vercellis, ISBN:978-81-265-4188-1, Wiley Publication 2. Data Mining and Business Intelligence by S. K. Shinde and Uddagiri Chandrashekhar
Reference Books
1. Data Warehousing in the Real World - Anahory & Murray, Pearson Edt. 2. Data Warehousing Fundamentals– Ponniah [Wiley Publication]

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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B.Tech. (Computer Science and Engineering), Semester-VII

22CSU7E14T : Professional Elective III : BIG DATA ANALYTICS

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hours/week	**ESE**	60 Marks
Practical	2 Hours/week	**ISE**	40 Marks
Credits	4	**ICA**	25 Marks

Course Objectives:

1. To know the fundamental concepts of big data and analytics
2. To focus on. storage, retrieval and processing of big data using Big Data Frameworks like Hadoop, map reduce jobs, Hadoop distributed File system and NOSQL.
3. To study MongoDB CRUD operations and its query language

Course Outcomes:

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

1. Comprehend limitations of conventional DBMS and recognize need for Big Data Analytics.
2. Compare Big data processing technologies and choose appropriate one for a given scenario.
3. Use Various Big data technologies for Big data analytics.
4. Implement Write Map Reduce program to process Big Data.

Unit – I	**Introduction to Types of Digital Data**	**4 Hours**

Classification of Digital Data, Structured Data, Sources of structured data, Ease with Structured data, Semi-Structured data, sources of semi-structured data, Unstructured data, sources of unstructured data, Issues with terminology, Dealing with unstructured data, Place me in the basket.

Unit – II	**Introduction to Big Data**	**4 Hours**

Big data, What is big data? Why big data? Other characteristics of data which are not definitional traits of big data, Challenges with big data, Big data stack, Exercises - Puzzle, Fill in the blanks.

Unit – III	**Big Data Analytics**	**4 Hours**

Big Data Analytics, Analytics 1.0, Analytics 2.0, Analytics 3.0, Traditional BI vs. Big Data Environment, Terminologies used in Big Data Environment, Big Data Technology Landscape, NoSQL Databases, NoSQL Vs. RDBMS, NewSQL, Hadoop, Hadoop 1.0 vs. Hadoop 2.0, Exercises, Data Science is multidisciplinary, Data Scientist - Your new best friend.

Unit – IV	**Introduction to Hadoop**	**10 Hours**

Introducing Hadoop, Why not RDBMS, Distributed Computing Challenges, A Brief History of Hadoop, Hadoop Overview, Hadoop Components, High Level Architecture of Hadoop, Hadoop Distributed File System, HDFS Architecture, Daemons Related to HDFS, Working with HDFS Command, Special Features of Hadoop, Processing Data With Hadoop, Introduction How Map Reduce Works, Map Reduce Example, Word Count Example using Java Managing Resources and Applications with YARN Introduction, Limitation of Hadoop 1.0, Hadoop 2: HDFS, Hadoop 2: YARN, Interacting with Hadoop EcoSystem Hive, Pig, HBase, Sqoop.

Unit – V	**Introduction to MongoDB**	**4 Hours**
Recap of NoSQL databases, MongoDB – CRUD, MongoDB- Arrays, Java Scripts, Cursors, Map Reduce Programming, Aggregations.		
Unit – VI	**Introduction to Cassandra**	**4 Hours**
Features of Cassandra, CQLSH - CRUD, Collections, Counter, List, Set, Map, Tracing.		
Unit – VII	**Introduction to Hive**	**8 Hours**
What is Hive? History of Hive and Recent Releases of Hive, Hive Features, Hive Integration and Work Flow, Hive Data Units, Hive Architecture, Hive Primitive and Collection Data Types, Hive File Format, Hive Query Language (HQL)–Statements – DDL, DML. Hive Partitions – Bucketing, Views, Sub Query, Joins, Hive User Defined Function, Aggregations in Hive, Group by and Having, Serialization and Deserialization, Hive Analytic Functions.		
Unit – VIII	**Introduction to Pig**	**4 Hours**
Introducing Pig, History and Anatomy of Pig, Pig on Hadoop, Pig Philosophy, ETL Processing, Pig Latin Overview, Word count example using Pig.		

Internal Continuous Assessment (ICA):

- Objective of assignments should be to test students understanding and assess their ability to put into practice the concepts and terminologies learned.
- Assignments must be of nature, which require students to identify the use case scenarios for using technologies mentioned in syllabus.
- It should consist of the 08-10 practical based on following guidelines

1. Basic big data operations using NumPy, SciPy & Pandas.
2. Implementation of Plotting, Filtering and Cleaning a CSV File Data Using NumPy & Pandas.
3. Linear Regression using WEKA.
4. Implement multidimensional visualization by adding variables such as color, size, shape, and label by using Tableau.
5. Apply Filters on Dimensions and Measures for any dataset using tableau.
6. Apply K-means Clustering on iris dataset in tableau.
7. Integrate R with tableau for data visualization.
8. Simple MongoDB and its CRUD Operations
9. Performing import, export and aggregation in MongoDB.
10. Performing CRUD operations using Cassandra.
11. Store the login details of the user such as UserID and Password. The information stored should expire in a day's time using time to live (TTL).
12. Map-Reduce Programming examples
13. Partitioning and processing using Hive.
14. Perform group by, order by, sort by, cluster by, distribute by queries using Hive.
15. Find out frequency of each word (word count) using pig

Text Books

1. Big Data and Analytics, Seema Acharya, Subhashini Chellappan, - Wiley India Pvt. Ltd.
2. Hadoop: The Definitive Guide, 3rd Edition, Tom White, - O'reilly Media.
3. Programming Hive, Edward Rutherglen, Dean Wampler, Jason Rutherglen, Edward Capriolo. - O'reilly Media.
4. The Definitive Guide to MongoDB: A Complete Guide to Dealing with Big Data Using

MongoDB (Definitive Guide Apress) 2e by David Hows, Eelco Plugge, Peter Membrey, Tim Hawkins.

5. Programming Pig, by Alan Gates - O'reilly Media.
6. Cassandra: The Definitive Guide, Eben Hewitt - O'reilly Media.

Reference Books

1. Big Data for Dummies, Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, Wiley Brand.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses (Wiley CIO), Michael Minelli, Michele Chambers, Ambiga Dhiraj: John Wiley & Sons.
3. Mining of Massive Datasets, Anand Rajaraman, Jure Leskovec, Jeff rey D. Ullman, Cambridge University Press.
4. Hadoop in Action, Chuck Lam, Dreamtech Press, ISBN : 978-81-7722-813-7.

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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B.Tech. (Computer Science and Engineering), Semester-VII

2CSU7E24T : Professional Elective III : INFORMATION RETRIEVAL

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hours/week	**ESE**	60 Marks
Practical	2 Hours/week	**ISE**	40 Marks
Credits	4	**ICA**	25 Marks

Course Objectives:

1. To acquaint students to information retrieval process and information models.
2. To evaluate the performance of information retrieval systems.
3. To search text using sequential searching & pattern matching algorithms and using various indexing structures.
4. To learn difference in data retrieval, information retrieval and multimedia retrieval systems.
5. To learn different components of search engine and ranking algorithms.

Course Outcome:

Students will be able to

1. Perform text operations, build classic information retrieval models, and evaluate the performance of information retrieval algorithms.
2. Formulate various queries for text retrieval.
3. Use various indexing and searching techniques to speed up text retrieval results.
4. Model, index and search documents containing multimedia objects.
5. Search web using web search engines & web directories and use ranking algorithms to rank web pages.

Unit – I	**Introduction**	**7 Hours**

Information retrieval vs. data retrieval, User Task, Logical View of the documents, Information retrieval process, Text Operations: Introduction, document pre-processing, Document Clustering, Text Compression, Comparing text compression techniques

Unit – II	**Information Retrieval Models & Performance Evaluation**	**8 Hours**

A Formal Characterization of IR Models, Classic Information Retrieval, Models for Browsing, Recall and Precision, Alternative measures

Unit – III	**Query Languages and Query Operations**	**7 Hours**

Keyword based querying, Pattern Matching, Query operations: User relevance feedback, Automatic local analysis, Automatic global analysis

Unit – IV	**Indexing and Searching**	**10 Hours**

Inverted Files and Indices for text search, Boolean Queries, Sequential searching, Pattern Matching

Unit – V	**Multimedia IR - Models and Languages**	**8 Hours**

Data Modelling & Query Languages, Indexing and searching

Unit – VI	Searching the Web	5 Hours
Search Engine architecture, User interfaces, Ranking, Web Crawling, Browsing, Meta searchers and Searching using Hyperlinks		
Internal Continuous Assessment (ICA) 1. Study of different search engines. 2. Perform text operation and create logical Views of documents. 3. Implementation of IR system using Boolean model. 4. Implementation of IR system using Vector model 5. Implementation of IR system using various types of queries. 6. Searching using inverted index (construction & Searching). 7. Sequential searching using Brute Force Algorithm. 8. Sequential searching using Knuth-Morris-Pratt Algorithm. 9. Sequential searching using Boyer- Moore Algorithm. 10. Sequential searching using BDM (Backward DAWG Matching) Algorithm. 11. Sequential searching using Shift-OR Algorithm. 12. Approximate matching using dynamic Programming. 13. Implementation of Multimedia Information Retrieval System.		
Text Books		
1. Modern Information Retrieval - Ricardo Baeza-Yates and Berthier Ribeiro-Neto-Pearson Education (Low Price Edition)		
Reference Books		
1. Introduction to Information Retrieval, Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Cambridge University Press. 2008. (http://nlp.stanford.edu/IRbook/information-retrieval-book.html) 2. Information Storage and Retrieval- Robert R Korthage, WILEY-INDIA		

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22CSU7E34T: Professional Elective III: MOBILE COMPUTING

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hours/week	**ESE**	60 Marks
Practical	2 Hours/week	**ISE**	40 Marks
Credits	4	**ICA**	25 Marks

Introduction:

Mobile Computing is a technology that allows transmission of data, voice and video via a computer or any other wireless enabled device without having to be connected to a fixed physical link. This subject will give an overview of Mobile Computing and then it will take you through how it evolved and where is the technology headed to in future along with the GSM & GPRS system.

Course Objectives:

1. To introduce concepts and principles of mobile computing.
2. To explore skills of finding solutions for mobile computing applications.

Course Outcomes:

At the end of the course, student will be able to
1. Apply the principles of mobile computing in the real time.
2. Analyze requirements of mobile compatible applications.

Unit – I	**Introduction to Wireless Communication**	**5 Hours**

History of wireless communication, Applications, Generations: 1G, 2G, 3G and 4G,
Modulation: Digital Modulations & Analog Modulation, Demodulation

Unit – II	**Wireless Transmission**	**6 Hours**

Frequencies for radio transmission, Signals, Signal propagation, Antennas, Multiplexing, Spread spectrum, Cellular system

Unit – III	**Medium Access Control**	**6 Hours**

Need of MAC algorithms, SDMA, FDMA, TDMA, CDMA

Unit – IV	**GSM**	**6 Hours**

Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security.

Unit – V	**New Data Services in GSM**	**5 Hours**

HSCSD, General packet radio service(GPRS) - GPRS and packet data network, GPRS architecture, Applications of GPRS, Limitations of GPRS, Mobile Number Portability

Unit – VI	**Wireless LAN**	**6 Hours**

Introduction, advantages and design goals for wireless LAN, Infrastructure, ad-hoc networks, IEEE 802.11: system and protocol architecture, physical layer, HIPERLAN protocol architecture and physical layer and MAC.		
Unit – VII	**Mobile Network Layer**	**6 Hours**
Mobile IP, DHCP		
Unit – VIII	**Mobile Transport Layer**	**6 Hours**
Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast & Selective retransmission & Recovery, Transmission Oriented TCP		

Internal Continuous Assessment (ICA):

Assignment List:

1. The message signal x(t)=Sin(100t) modulates the carrier signal c(t)=A Cos(2πfct). Using amplitude modulation, find the frequency content of the modulated signal.
2. Compare and discuss the various techniques used in Multiple Division Techniques.
3. A TDMA system uses a 270.833Kbps data rate to support eight users per frame.
    - What is the raw data provided for each user?
    - If guard time and synchronization occupy 10.1Kbps, determine the traffic efficiency.
4. Give reasons for a handover in GSM and the problems associated with it. What are the typical steps for hand over, What types of handovers can occur?
5. Which resources need to be allocated during handover for data transmission using HSCSD or GPRS respectively? What about QoS guarantees?
6. How GPRS work? What are the data services used in GPRS?
7. How do IEEE 802.11, Hiper LAN2 and Bluetooth, respectively, solve the hidden terminal problems?
8. List the entities of mobile IP and describe data transfer from a mobile node to a fixed node and vice versa. Why and where is encapsulation needed?
9. What is the basic purpose of DHCP? Name the entities of DHCP. How can DHCP be used for mobility and support of mobile IP?
10. How and why does I-TCP (Indirect TCP) isolate problems on the wireless link? What are the main drawbacks of this solution?

Text Books

1. Mobile Communications – Jochen Schiller (PEARSON) (Chapters: 1, 2, 3, 5, 7, 8)
2. Introduction to Wireless and Mobile System-D.P. Agrawal and Qing-AnZeng (CENGAGE) (Chapter:1,6)

Reference Books

1. Wireless Communication –Principles and practice - Theodore S. Rappaport (PEARSON)
2. Mobile and Personal Communication Systems and Services - Raj Pandya –(PHI)
3. Mobile Computing-Technology, Applications and Service Creation-Asoke K Talukder, Hasan Ahmed and Roopa R Yavagal. (MGH)

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22CSU7CC5P: DevOps

Teaching Scheme		**Examination Scheme**	
Lectures	2 Hours/week	**ISE**	25 Marks
Practical	2 Hours/week	**ICA**	25 Marks
Credits	3	**POE**	25 Marks

Introduction:

DevOps is a transformative culture and practice that unites software development (Dev) and IT operations (Ops) teams. By fostering collaboration and leveraging automation technologies, DevOps enables faster, more reliable code deployment to production in an efficient and repeatable manner.

Course Objectives:

1. To introduce DevOps terminology, definition & concepts
2. To understand the different Version control tools.
3. To understand the concepts of Continuous Integration/Continuous Deployment)
4. To get acquainted with concept of docker and kubernets
5. To Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems.

Course Outcomes:

At the end of the course, students will be able to
1. Apply DevOps principles to meet software development requirements.
2. Apply CI/CD using tools such as Jenkins, Git and Maven.
3. Analyze the Containerization of images and deployment of applications over Docker.
4. Collaborate and adopt Devops in real-time projects.

Unit – I	**Introduction to DevOps**	**5 Hours**

Devops Essentials - Introduction to AWS, GCP, Azure - Version control systems: Git and Github, Introduction to GitLab, Introduction to Bit Bucket

Unit – II	**Compile and Build Using Maven**	**5 Hours**

Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build Phases (compile build, test, package) Maven Profiles, Maven Repositories (local, central, global), Maven plugins, Maven Create and Build Artifacts, Dependency Management

Unit – III	**Continuous Integration Using Jenkins**	**5 Hours**

Introduction to CI/CD, Install & Configure Jenkins, Jenkins Architecture Overview, Build Jobs and Configurations, Jenkins Plugins, Jenkins Integration with other Tools

Unit – IV	**Containerization with Docker**	**5 Hours**

Introduction to Containerization, Introduction to Docker, Understanding Images and Containers, Working with Containers.

Unit – V	**Kubernetes**	**5 Hours**
Introduction to Kubernetes, Need of Kubernetes, Kubernetes Architecture, Setup Kubernetes, Kubernetes Concepts		
Unit – VI	**Building DevOps Pipelines Using any Cloud Platform**	**5 Hours**
Create Github Account, Create Repository, Create Organization, Create a New Pipeline, Build a Sample Code		

Internal Continuous Assessment (ICA):

1. Set up the Git Server and perform the following operations:
   - Create a Repository
   - Create Branches
   - Perform Add, Commit, Push, Pull
   - Merge and Rebase
   - Squashing Commits
   - Delete branches
   - Undo commits
2. Perform the following operations on Git and GitHub
   - Create a Repository
   - Create Branches
   - Perform Add, Commit, Push, Pull
   - Fork a project, Open and merge Pull request
   - Merge and Rebase
   - Squashing Commits
   - Delete branches
   - Undo commits
3. Perform the following operations on Git and GitLab.
   - Create a Repository/Project
   - Create Branches
   - Perform Add, Commit, Push, Pull
   - Undo commits
   - Fork a project, Open and merge Pull request
   - Merge and Rebase
   - Squashing Commits
   - Delete local & remote branches
4. Set up a GitLab CI/CD Pipeline.
5. Automate Deployment using Jenkins plugin “Deploy to container”
6. Use Jenkins “Deploy to Container Plugin” and “Build Pipeline Plugin”.
7. Build a Docker image and push it to Docker Hub. Pull it on another system. Create and run a new container from an image. (Note: Perform commands on PowerShell / Command Prompt.)
8. Set up a Jenkins job that picks up an application from a GitHub repository, builds it, and runs it and dockerizes the application.
9. Create an application, push to GitHub/GitLab repository. Use GitHub/GitLab, Maven,Tomcat with Jenkins. Automate Deployment of the application to a container (Tomcat).

Text Books

1. DevOps Tools from Practitioner's Viewpoint. Deepak Gaikwad, Viral Thakkar, Wiley publications.
2. Jenkins, The Definitive Guide, John Ferguson Smart, O'Reilly Publication.

Reference Books

1. The DevOps2.1Tool Kit: Docker Swarm, Building, Testing, Deploying and Monitoring services inside Docker Swarm clusters by Viktor Farcic Packt Birmingham, Mumbai.
2. Mariot Tsitoara, "Ansible6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer", Second Edition, 2019.
3. https://maven.apache.org/guides/getting-started/

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22CSU7PR6L: Project Phase I

Teaching Scheme		**Examination Scheme**	
Practical	4 Hours/week	**ICA**	50 Marks
Credits	2	**POE**	50 Marks

Introduction:

Project-based learning is a well-established educational paradigm gaining increasing importance today. To align with this approach, a project course is integrated into the final year curriculum, spanning both semesters. In this course, students work in teams to undertake a project, allowing them to showcase their abilities and develop expertise in their chosen areas of interest. The projects can involve both hardware and software, with a strong emphasis on design and research aspects. Additionally, effective communication, both oral and written, is a crucial skill for engineering graduates in various contexts. This course aims to cultivate these essential communication skills as well.

Course Prerequisite:

A student must possess both technical competency and effective teamwork skills to successfully contribute to a project. This includes adopt knowledge of software architecture, as well as associated programming skills. Additionally, the student should have strong technical report writing and presentation abilities, along with proficiency in office software for word processing and creating presentations.

Course Objectives:

1. To expose students to software engineering industries, enabling them to identify problem areas and formulate problem statements.
2. To equip students with the ability to design electronic and software systems that addresses the identified problems.
3. To develop students' skills in designing the hardware and software architecture for their projects.
4. To train students in writing technical specifications and project documentation for their chosen problems.

Course Outcomes:

At the end of course, students will be able to

1. Conduct a comprehensive literature review to identify a project that addresses societal and environmental needs for sustainable development.
2. Develop a detailed project plan, including a timeline and an estimated budget.
3. Utilize engineering expertise to design the hardware and software architecture required for the project.
4. Exhibit teamwork and presentation skills by preparing thorough reports and delivering presentations, while adhering to professional ethical standards.

Guidelines:
1. The student will finalize the project after obtaining approval from their guide and submit a synopsis along with a presentation. 2. The student should prepare the project design. 3. The project synopsis should ideally include an abstract, literature survey, problem definition, and proposed system and design. 4. The student will need to present a seminar on the project design implemented and submit project phase -I report.

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22CSU8PR1L: Project Phase II

Teaching Scheme		**Examination Scheme**	
Practical	4 Hours/week	**ICA**	50 Marks
Credits	2	**POE**	50 Marks

Course Objectives:

1. To familiarize with the industry landscape.
2. To gain comprehensive knowledge of software and hardware development tools and techniques for solving real-world problems.
3. To learn to demonstrate professional and ethical responsibilities.

Course Outcomes:

At the end of the course students will be able to

1. Utilize hardware and software development tools and methodologies to solve real-world problems.
2. Convey a vocational training report proficiently through written and oral presentations.
3. Demonstrate professional and ethical responsibilities.
4. Integrate knowledge, skills, and professional practices effectively.

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22CSU8IN2L: Internship II/ On Job Training (OJT)

Teaching Scheme		**Examination Scheme**	
Practical	20 Hours/week	**ESE**	100 Marks
Credits	10	**ICA**	100 Marks

Introduction:

Internships / On Job Training serve as crucial educational and career development experiences, offering hands-on learning in specific fields or disciplines. They play a significant role in equipping individuals with essential industry skills, awareness of professional practices, and familiarity with organizational culture. Typically, structured and short-term, internships / On Job Training provide supervised training center on particular tasks or projects, adhering to defined timelines.

Course Objectives:

1. To provide technical students with hands-on experience in industrial environments, essential for developing industry-ready professionals.
2. To equip students with real-time technical and managerial skills necessary for their future careers.
3. To familiarize students with various materials, processes, products, and software applications, emphasizing quality control principles.
4. To introduce students to engineering ethics and responsibilities in professional practice.
5. To explore the social, economic, and administrative factors that impact industrial organizations' working environments.

Course Outcomes:

At the end of course, students will be able to
1. Develop professional competence through an internship experience.
2. Apply academic knowledge effectively in both personal and professional environments.
3. Expand their professional network and gain exposure to potential future employers.
4. Demonstrate the application of professional and societal ethics in their daily lives.
5. Formulate their own career goals and align them with personal aspirations.

Guidelines

Internship II / On Job Training (OJT):
1. Students may complete an internship / On Job Training (OJT) of a minimum of two months duration at the industry during Final Year Sem VIII.
2. The industry shall appoint a Supervisor to assess the performance of the student and share the same with the departmental supervisor for the fulfillment of ICA marks
3. Every intern must submit a weekly report to their internal guide without exception. Interns are required to have bi-weekly communication with their internal guide without exception.
4. During the internship, the student will present a seminar in online /offline mode based on his training / Project before an expert committee established by the department in accordance with institute guidelines.
5. The student shall prepare a report of the work completed at the industry duly endorsed by the industry Supervisor and submit the same as an Internship report.
6. The ESE for Internship II / On Job Training (OJT) shall be conducted by the Departmental Supervisor in the presence.