

Teaching Scheme of B.Tech.-IV (CSE) (Semester VII)

Sr. No.	Course	Code	Credit	Teaching Scheme			Examination Scheme			Total
				L	T	P	L	T	P	
1	Software Engineering (Core-15)	CS401	5	3	1	2	100	25	50	175
2	Innovation, Incubation and Entrepreneurship	HU410	3	3	0	0	100	0	0	100
3	Core Elective-3	CS4AA	3	3	0	0	100	0	0	100
4	Core Elective-4	CS4BB	3	3	0	0	100	0	0	100
5	Summer Training*	CS403	2	0	0	0	0	0	50	50
6	Project Preliminaries	CS405	3	0	0	6	0	0	150	150
	Total		19	12	1	8	400	25	250	675
	Total Contact Hours per week			21						

*Summer training is to be organized in the summer vacation after 6th Semester.

Practical Examination Scheme (Internal 50% and External 50%)

Core Elective-3 (CS4AA):

1	Computer Graphics (CS421)	4	Video Codec standards and Design (CS427)
2	Blockchain Technology (CS423)	5	Computational Geometry (CS429)
3	Smartphone Computing and Applications (CS425)		

Core Elective-4 (CS4BB):

1	Data Warehousing and Mining (CS441)	4	Audio and Speech Signal Processing (CS447)
2	High Performance Computing (CS443)	5	Service Oriented System (CS449)
3	Security in Resource Constrained Environment (CS445)		

B.Tech. IV (CSE) Semester – VII
SOFTWARE ENGINEERING (CORE-15)
CS401

Scheme

L	T	P	Credit
3	1	2	05

1. Course Outcomes (COs):

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

CO1	understand various phases of software development lifecycle.
CO2	apply appropriate software modelling and testing techniques for the given application scenario.
CO3	analyse various tools and techniques used in software development lifecycle.
CO4	evaluate the software for quality and risk factors.
CO5	design and develop software systems using appropriate software processes.

2. Syllabus

- INTRODUCTION (02 Hours)**
Software Process - Software Development Life Cycle – Software Qualities - Problems with Software Production – Brooke’s No Silver Bullet.
- SOFTWARE LIFE-CYCLE MODELS (04 Hours)**
Build-and-Fix, Waterfall, Rapid Prototyping, Incremental, Spiral, Agile, Comparison, ISO 9000 – CMM levels – Comparing ISO 9000 and CMM.
- SOFTWARE REQUIREMENTS AND ANALYSIS (06 Hours)**
Techniques - Feasibility Analysis - Requirements Elicitation – Validation - Rapid Prototyping - OO Paradigms vs. Structured Paradigm - OO Analysis (Modules, Object, Cohesion, Coupling, Objects and Reuse) - CASE tools.
- SOFTWARE SPECIFICATIONS (12 Hours)**
Specification Document – Specification Qualities, Uses, Classification – Operational Behavioural – DFD, Overview of UML Diagrams, Finite State Machines, Petri nets – Descriptive Specifications – ER Diagrams, Logic, Algebraic Specs - Comparison of Various Techniques and CASE Tools.
- FORMAL METHODS IN SOFTWARE ENGINEERING (06 Hours)**
Formal Specifications, Software Verification & Validation, Clean Room Engineering, - Formal Approaches, Model Checking – SPIN Tool for Distributed Software.
- CASE TOOLS, ISO AND CAPABILITY MATURITY MODEL (04 Hours)**

CASE Tools - Stepwise Refinement - Cost-Benefit Analysis - Scope of CASE - Versions Control - Current State of the Art in Software Engineering-Current State of the Art.

- **SOFTWARE TESTING PRINCIPLES** (06 Hours)

Non-execution & Execution based Testing – Automated Static Analysis – Test-Case Selection - Black-Box and Glass-Box Testing - Testing Objects - Testing vs. Correctness Proof.

- **ADVANCED TOPICS** (02 Hours)

- **Tutorials will be based on the coverage of the above topics separately** (14 Hours)

- **Practicals will be based on the coverage of the above topics separately** (28 Hours)

(Total Contact Time: 42 Hours + 14 Hours + 28 Hours = 84 Hours)

3. Tutorials:

- 1 Based on: SDLC.
- 2 Based on: Requirements engineering.
- 3 Based on: Data flow diagram.
- 4 Based On: Use case, Sequence diagrams, Collaboration diagrams.
- 5 Based on: FSM, Petri nets.
- 6 Based on: Logic specification, Algebraic specification.
- 7 Based on: Software cost estimation and quality assurance.
- 8 Based on: Software test case designing.

4. Practicals:

- 1 Splint tool- Introduction, Installation and Exploring Tool.
- 2 Designing C program fragment for all class of errors listed for splint tool and to Compare the outputs of Splint and the Standard C compiler.
- 3 Spin tool and Promela language introduction, Spin installation, Exploring tool and language usage.
- 4 Designing promela models and their verification in Spin.
- 5 Mini project : Identifying and formulating a software engineering problem, identifying it's specifications, designing it using various models introduced in classes, implementing prototype of that system, and testing the software systems that meets specification, performance, maintenance and quality requirements.
- 6 Implementation of testing tools.
- 7 Implementation of software development models.
- 8 Implementation of agile technology based software development.

5. Books Recommended:

1. Rajib Mall: “Fundamentals of Software Engineering”, 4/E, PHI Learning, 2015.
2. Sommerville: “Software Engineering”, 9/E, Pearson Education, 2010.
3. Stephen R Schach: “Object Oriented and Classical Software Engineering”, McGraw-Hill 8/E, 2010.
4. Roger S Pressman: “Software Engineering – A Practitioner’s Approach”, McGraw-Hill 7/E, 2010.
5. Pankaj Jalote: “An Integrated approach to Software Engineering”, Narosa, 3/E, 2005.

ADDITIONAL REFERENCE BOOKS

1. Ghezzi, Jazayeri, Mandrioli: “Fundamentals of Software Engineering”, 2/E, Pearson Education, 2002.
2. Stephen R Schach: “Software Engineering with JAVA”, TMH, 1999.

B.Tech. IV (CSE) Semester – VII
INNOVATION, INCUBATION AND ENTREPRENEURSHIP
HU410

Scheme

L	T	P	Credit
3	0	0	03

1. Course Outcomes (COs):

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

CO1	explain the concepts of entrepreneurship.
CO2	develop skills related to various functional areas of management (Marketing Management, Financial Management, Operations Management, Personnel Management etc.).
CO3	develop skills related to Project Planning and Business Plan development.
CO4	demonstrate the concept of Innovation, Intellectual Property Rights (IPR) and Technology Business incubation.
CO5	build knowledge about Sources of Information and Support for Entrepreneurship.
CO6	develop entrepreneurial culture.

2. Syllabus

• **CONCEPTS OF ENTREPRENEURSHIP (10 Hours)**

Scope of Entrepreneurship, Definitions of Entrepreneurship and Entrepreneur, Characteristics of an Entrepreneur, Entrepreneurial Development models and Theories, Entrepreneurs Vs Managers Classification of Entrepreneurs; Major types of Entrepreneurship – Techno Entrepreneurship, Women Entrepreneurship, Social Entrepreneurship, Intrapreneurship (Corporate entrepreneurship), Rural Entrepreneurship, Family Business etc.; Problems for Small Scale Enterprises and Industrial Sickness; Entrepreneurial Trait Tests; Entrepreneurial Environment – Political, Legal, Technological, Natural, Economic, Socio – Cultural etc. ; Motivation; Business Opportunity Identification.

• **FUNCTIONAL MANAGEMENT AREA IN ENTREPRENEURSHIP (12 Hours)**

Marketing Management: Basic concepts of Marketing, Development of Marketing Strategy and Marketing plan, Online Marketing, New Product Development Strategy.

Operations Management: Basic concepts of Operations management, Location problem, Development of Operations strategy and plan.

Personnel Management: Main operative functions of a Personnel Manager, Development of H R strategy and plan.

Financial Management: Basics of Financial Management, Ratio Analysis, Capital Budgeting, Working Capital Management, Cash Flow Statement, Break Even Analysis.

• **PROJECT PLANNING (06 Hours)**

Product Development – Stages in Product Development; Feasibility analysis – Technical, Market, Economic, Financial etc.; Project report; Project appraisal; Setting up an Industrial unit – procedure and formalities in setting up an Industrial unit; Business Plan Development.

- **PROTECTION OF INNOVATION THROUGH IPR (04 Hours)**

Introduction to Intellectual Property Rights – IPR, Patents, Trademarks, Copy Rights.

- **INNOVATION AND INCUBATION (06 Hours)**

Innovation and Entrepreneurship, Creativity, Green Technology Innovations, Grassroots Innovations, Issues and Challenges in Commercialization of Technology Innovations, Introduction to Technology Business Incubations, Process of Technology Business Incubation.

- **SOURCES OF INFORMATION AND SUPPORT FOR ENTREPRENEURSHIP (04 Hours)**

State level Institutions, Central Level institutions and other agencies.

(Total Contact Time: 42 Hours)

3. Books Recommended:

1. Desai Vasant, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, India, 6th Revised Edition, 2011.
2. Charantimath P. M., "Entrepreneurial Development and Small Business Enterprises", Pearson Education, 3rd Edition, 2018.
3. Holt David H., "Entrepreneurship: New Venture Creation", Pearson Education, 2016.
4. Chandra P., "Projects: Planning, Analysis, Selection, Financing, Implementation and Review", Tata McGraw Hill, 9th Edition, 2019.
5. Banga T. R. & Shrama S.C., "Industrial Organisation & Engineering Economics", Khanna Publishers, 25th Edition, 2015.

ADDITIONAL REFERENCE BOOKS

1. Prasad L.M., "Principles & Practice of Management", Sultan Chand & Sons, 8th Edition, 2015.
2. Everett E. Adam, Ronald J. Ebert, "Production and Operations Management", Prentice Hall of India, 5th edition, 2012.
3. Kotler P., Keller K. L, Koshi A. & Jha M., "Marketing Management – A South Asian Perspective", Pearson, 14th Edition, 2014.
4. Tripathi P.C., "Personnel Management & Industrial Relations", Sultan Chand & sons, 21st Edition, 2013.
5. Chandra P., "Financial Management", Tata McGraw Hill, 9th Edition, 2015.

B.Tech. IV (CSE) Semester – VII
BLOCKCHAIN TECHNOLOGY (CORE ELECTIVE - 3)
CS423

Scheme

L	T	P	Credit
3	0	0	03

1. Course Outcomes (COs):

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

CO1	understand the need, functions and challenges of blockchain technology.
CO2	deploy smart contracts for given use cases.
CO3	analyse blockchain based system structure and security offered therein.
CO4	asses functions, benefits and limitations of various blockchain platforms.
CO5	design and develop solution using blockchain technology in various application domains.

2. Syllabus

- **INTRODUCTION (04 Hours)**
Introduction to Blockchain Technology, Concept of Blocks, Transactions, Distributed Consensus, the Chain and the Longest Chain, Cryptocurrency, Blockchain 2.0, Permissioned Model of Blockchain, Permission less Blockchain.
- **DECENTRALIZATION USING BLOCKCHAIN (06 Hours)**
Methods of Decentralization, Disintermediation, Contest-Driven Decentralization, Routes to Decentralization, the Decentralization Framework Example, Blockchain and Full Ecosystem Decentralization, Storage, Communication, Computing Power and Decentralization, Smart Contracts, Decentralized Autonomous Organizations, Decentralized Applications (DApps), Requirements and Operations of DApps, DApps Examples, Platforms for Decentralizations.
- **CRYPTO PRIMITIVES FOR BLOCKCHAIN (04 Hours)**
Symmetric and Public Key Cryptography, Cryptographic Hard Problems, Key Generation, Secure Hash Algorithms, Hash Pointers, Digital Signatures, Merkle Trees, Patricia trees, Distributed Hash Tables.
- **BITCOINS AND CRYPTOCURRENCY (06 Hours)**
Introduction, Digital Keys and Addresses, Private and Public Keys in Bitcoins, Base58Check Encoding, Vanity Addresses, Multi Signature Addresses, Transaction Lifecycle, Data Structure for Transaction, Types of Transactions, Transaction Verification, The Structure of Block in Blockchain, Mining, Proof of Work, Bitcoin Network and Payments, Bitcoin Clients and APIs, Wallets, Alternative Coins, Proof of Stake, Proof of Storage, Various Stake Types, Difficulty Adjustment and Retargeting Algorithms, Bitcoin Limitations.

- **SMART CONTRACTS** (02 Hours)
Smart Contract Templates, Oracle, Smart Oracle, Deploying Smart Contract on Blockchain.
 - **PERMISSIONED BLOCKCHAIN** (05 Hours)
Models and Use-cases, Design Issues, Consensus, Paxos, RAFT Consensus, Byzantine General Problem, Practical Byzantine Fault Tolerance.
 - **DEVELOPMENT TOOLS AND FRAMEWORKS** (05 Hours)
Solidity Compilers, IDEs, Ganache, Metamask, Truffle, Contract Development and Deployment, Solidity Language, Types, Value Types, Literals, Enums, Function Types, Reference Types, Global Variables, Control Structures, Layout of Solidity Source Code File.
 - **HYPERLEDGER** (05 Hours)
The Reference Architecture, Requirements and Design Goals of Hyperledger Fabric, The Modular Approach, Privacy and Confidentiality, Scalability, Deterministic Transactions, Identity, Auditability, Interoperability, Portability, Membership Services in Fabric, Blockchain Services, Consensus Services, Distributed Ledger, Sawtooth Lake, Corda.
 - **BLCOKCHAIN USE-CASES AND CHALLENGES** (05 Hours)
Finances, Government, Supply Chain, Security, Internet of Things, Scalability and Challenges, Network Plane, Consensus Plane, Storage Plane, View Plane, Block Size Increase, Block Interval Reduction, Invertible Bloom Lookup Tables, Private Chains, Sidechains, Privacy Issues, Indistinguishability Obfuscation, Homomorphic Encryption, Zero Knowledge Proofs, State Channels, Secure Multiparty Computation, Confidential Transactions.
- (Total Contact Time = 42 Hours)**
-

3. Books Recommended:

1. Imran Bashir, "Mastering Blockchain", 2/E, Packt publishing, Mumbai, 2018.
2. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", 2/E, O'Reilly, 2014.
3. Melanie Swan, "Blockchain Blueprint for a New Economy", 1/E, O'Reilly Media, 2015.
4. Don and Alex Tapscott, "Blockchain Revolution", 1/E, Penguin Books Ltd, 2018.
5. Alan T. Norman, "Blockchain Technology Explained", 1/E, CreateSpace Independent Publishing Platform, 2017.

B.Tech. IV (CSE) Semester – VII

DATA WAREHOUSING AND MINING (CORE ELECTIVE - 4)

CS441

Scheme

L	T	P	Credit
3	0	0	03

1. Course Outcomes (COs):

At end of the course, student will be able to

CO1	understand concepts of Data Warehouse and Data Mining and various application domains of DW and DM.
CO2	apply high dimensional modelling and OLAP operations of DW along with Data Mining solutions.
CO3	analyse DM algorithms to solve real world problems.
CO4	evaluate different data mining techniques like data compression, classification, prediction, clustering and association rule mining.
CO5	design and innovate a solution for the given problem.

2. Syllabus

- **OVERVIEW (02 Hours)**
Motivation for Data Mining , Definition and Functionalities, Classification of DM Systems, Integration of a Data Mining System with a Database/Data Warehouse, Issues in DM – KDD Process.
- **DATA PREPROCESSING AND DATA MINING PRIMITIVES (06 Hours)**
Need to Pre-process the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation, Data Mining Primitives: What Defines a Data Mining Task?
- **CLASSIFICATION (07 Hours)**
Issues Regarding Classification and Prediction, Categorization of Classification Methods, Decision Tree, Bayesian Classification, Rule Based, CART, Neural Network, CBR, Rough set Approach, Fuzzy Logic, Genetic Algorithms, Prediction Methods, Linear and Nonlinear Regression, Logistic Regression.
- **CLUSTERING (07 Hours)**
Types of Data in Cluster Analysis, Categorization of Major Clustering Methods, Similarity and Distance Measures, Hierarchical Algorithms, Partitioned Algorithms, Clustering Large Databases.

- **ASSOCIATION RULE MINING** (06 Hours)
Data Generalization and Summarization-Based Characterization, Attribute Relevance, Class Comparisons, Association Rule Mining Introduction, Market Basket Analysis - Basic Concepts, Finding Frequent Item Sets, Apriori Algorithm, Generating Rules, Improved Apriori Algorithm, Incremental ARM, Associative Classification – Rule Mining, FP Growth Rule Mining Algorithm.
- **INTRODUCTION TO DATA WAREHOUSING** (04 Hours)
Need of Reporting and Analysing data, Raw Data to Valuable Information-Lifecycle of Data, Business Intelligence (BI) and DW in Today's Perspective, Decision Support Systems, Difference Between database System and Data Warehouse, Overview of the Components of DW, Data Warehouse Life Cycle, Data Warehousing Components, Data Warehousing Architecture, On Line Analytical Processing, Categorization of OLAP Tools.
- **ARCHITECTURE OF BUSINESS INTELLIGENCE AND DATAWAREHOUSE** (06 Hours)
BI and DW Architectures and its Types - Relation Between BI and DW - OLAP (Online analytical processing) Definitions - Difference between OLAP and OLTP, Multi-dimensional Analysis , Data Cubes, Drill-down and Roll-up - Slice and Dice or Rotation, OLAP Models , ROLAP versus MOLAP – defining.
- **DM AND DW FOR BUSINESS APPLICATION** (04 Hours)
Data Mining for Business Applications like Balanced Scorecard, Fraud Detection, Clickstream Mining, Market Segmentation, Retail Industry, Telecommunications Industry, Banking & Finance and CRM, Social Media Data Analysis etc.

(Total Contact Time = 42 Hours)

3. Books Recommended:

1. J. Han and M. Kamber, "Mining: Data Concepts and Techniques", 3rd Edition, Morgan Kaufman, 2011. ISBN 978-0-12-381479-1.
2. Margaret Dunham, "Data Mining: Introductory and Advanced Topics:", 3rd Edition, Published by Prentice Hall. ISBN-13: 978-8177587852.
3. Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining, and OLAP", 2nd Edition, Tata McGraw- Hill, 2004. ISBN 13: [9780070587410](#).
4. George M Marakas, "Modern Data Warehousing, Mining and Visualization", 2nd Edition, Pearson Education. ISBN 13: 9780131014596.
5. Ralph Kimball, Margy Ross, "The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling", 3rd Edition, Pearson Education Limited. ISBN-13: 978-1118530801.