DEPARTMENT

OF

COMPUTER SCIENCE AND BUSINESS SYSTEM

B. Tech
(R21 B.Tech CSBS)

R21 IV YEAR COURSE STRUCTURE

VIGNANA BHARATHI®
Institute of Technology

(A UGC Autonomous Institution, Approved by AICTE, Accredited by NBA & NAAC-A Grade, Affiliated to JNTUH)

IV YEAR I SEMESTER

S.No	Course Code	Course Title	Category	L	T	P	C
1	21MB4111	Fundamentals of Management and Organizational Behavior	HS	3	-	-	3
2	21BU4112	Fundamentals Of Data Science	PC	3	1	-	4
		Professional Elective – III					
	21IT4173	Big Data Technologies	PE				
	21DS4171	Software Testing Methodologies	PE				
3	21CS4174	Cloud Computing	PE	3	-	-	3
	21BU4174	Block Chain Technology	PE				
		Professional Elective – IV					
			PE				
4	21BU4175	Data Warehousing and Data Mining		3	-	-	3
	21BU4176	Digital Payment Systems	PE				
	21BU4177	Natural Language Processing	PE				
	21BU4178	Social Media Analytics	PE				
5		**Open Elective III**	OE	3	-	-	3
6	21BU4151	Fundamentals of Data Science Lab	PC	-	-	3	1.5
7	21BU4181	Mini Project	PW	-	-	4	2
		Total Credits		**15**	**1**	**7**	**19.5**

IV YEAR II SEMESTER

S.No	Course Code	Course Title	Category	L	T	P	C
1	21MB4213	Human Resource Management	HS	3	-	-	3
		Professional Elective – V					
	21BU4271	Innovation IP Management and Entrepreneurship	PE				
	21IT4271	Deep Learning	PE				
2	21BU4273	Image Processing	PE	3	-	-	3
	21BU4274	DevOps	PE				
3		**Professional Elective-VI**		3	-	-	3
	21BU4275	Financial Modeling					
	21BU4276	Decision Support Systems	PE				
	21BU4277	Adhoc and Sensor Networks					
	21BU4278	Enterprise Resource Planning					
4	21BU4281	Major Project	PW	-	-	20	10
		Total Credits		**9**	**0**	**20**	**19**

DEPARTMENT OF

COMPUTER SCIENCE AND BUSINESS SYSTEMS

(R21 B.Tech CSBS)

R21-IV YEAR SYLLABUS

VIGNANA BHARATHI®
Institute of Technology

(A UGC Autonomous Institution, Approved by AICTE, Accredited by NBA & NAAC-A Grade, Affiliated to JNTUH)

21MB4111: FUNDAMENTALS OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOR

B.Tech. IV Year I Sem.

L	T	P	C
3	-	-	3

Course Objective:

- To understand the fundamentals of management, history and evolution of management theories
- To analyze various dimensions of organizational planning and organizing.
- To understand the functions of staffing, Directing and controlling.
- To understand the fundamental concepts of Organizational Behaviour.
- To analyze and evaluate the various dimensions of Cognitive process and Stress related issues in Organizational Behaviour.

Course Outcomes: After the completion of the course, student should be able to

- Understand the fundamentals of management and contribution of management thinkers.
- Analyze the relevance and importance of planning and organizing.
- Understand the importance of organizing, types of organizational structures and various function of human resource management
- Understand fundamental concepts of organizational behaviour
- Analyze and evaluate the various dimensions of cognitive process and stress related issues in organizational behaviour.

UNIT- I
Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management.
Approaches- Classical Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT – II
Planning and Organizing: General Framework for Planning - Planning Process, Types of Plans,
Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization.

UNIT- III
Staffing: Functions of HRM.
Leadership: Leadership Styles; Leadership theories.
Motivation - Types of Motivation; Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X, Theory Y and Theory Z.
Communication: Types of communication, Importance, Communication Process and communication Barriers.
Controlling: Process of controlling, Types of Control

UNIT- IV

Introduction to OB - Definition, Nature and Scope –Environmental and organizational context – Impact of IT, globalization, Diversity, Ethics, culture, reward systems and organizational design on Organizational Behaviour. Cognitive Processes-I : Perception and Attribution: Nature and importance of Perception – Perceptual selectivity and organization -Social perception – Attribution Theories.

UNIT- V

Cognitive Processes-II: Personality and Attitudes - Personality as a continuum – Meaning of personality - Johari Window and Transactional Analysis - Nature and Dimension of Attitudes- Stress and Conflict: Meaning and types of stress –Meaning and types of conflict - Effect of stress and intra-individual conflict - strategies to cope with stress and conflict.

TEXT BOOKS:

1. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009
3. Principles and Practice of Management, L. M. Prasad, S. Chand, 2019, New Delhi.
4. Robbins, P. Stephen, Timothy A. Judge: Organisational Behaviour, 12/e, PHI/Pearson, NewDelhi, 2009.

REFERENCES:
1. Newstrom W. John & Davis Keith, Organisational Behaviour-- Human Behaviour at Work, 12/e,TMH, New Delhi, 2009.
2. Luthans, Fred: Organizational Behaviour 10/e, McGraw-Hill, 2009.

VIGNANA BHARATHI
Institute of Technology ®

(A UGC Autonomous Institution, Approved by AICTE, Accredited by NBA & NAAC-A Grade, Affiliated to JNTUH)

21BU4112 - FUNDAMENTALS OF DATA SCIENCE

	L	T	P	C
	3	1	-	4

B. Tech IV Year

I Semester Course

Objectives
1. To learn concepts, techniques and tools that need to deal with various facets of data science practice, including data collection and integration
2. To exploring data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and effective communication
3. To understand the basic knowledge of algorithms and reasonable programming experience and some familiarity with basic linear algebra and basic probability and statistics
4. To learn concepts, techniques and tools for Web Scrapping
5. To identify the importance of recommendation systems and data visualization techniques

Course Outcomes
1. Understand basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data
2. Discuss the significance of exploratory data analysis (EDA) in data science and to apply basic tools (plots, graphs, summary statistics) to carry out EDA
3. Apply basic machine learning algorithms and their usage in applications.
4. Enable to explore Web Scrapping tools and apply algorithms for Feature generation and selection from Web.
5. Analyze data and give pictorial representation using Data Visualization tools and address ethical issues

UNIT I:
Introduction: What is Data Science? - Big Data and Data Science hype – and getting past the hype - Why now? – Datafication - Current landscape of perspectives - Skill sets needed - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model, Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types

UNIT II:
Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Case Study: Real Direct (online real estate firm) - Three Basic Machine Learning Algorithms, Linear Regression - k-Nearest Neighbors (k-NN) - k-means

UNIT III:
Machine learning Algorithms and Applications - Motivating application: Filtering Spam - Why Linear Regression and k-NN are poor choices for Filtering Spam - Naive Bayes and why it works for Filtering Spam

UNIT IV:

Data Wrangling: APIs and other tools for scrapping the Web - Feature Generation and Feature Selection (Extracting Meaning From Data) - Motivating application: user (customer) retention - Feature Generation (brainstorming, role of domain expertise, and place for imagination) - Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests

UNIT V:

Data Visualization - Basic principles, ideas and tools for data visualization 3 - Examples of inspiring (industry) projects - Exercise: create your own visualization of a complex dataset - Data Science and Ethical Issues - Discussions on privacy, security, ethics - A look back at Data Science - Next- generation data scientists

TEXT BOOKS:

1. Doing Data Science, Straight Talk from the Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014
2. Mining of Massive Datasets v2.1, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, Cambridge University Press, 2014
3. Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, 2013 (ISBN 0262018020)

REFERENCE BOOKS:

1. Elements of Statistical Learning, Trevor Hastie, Robert TiBUhirani and Jerome Friedman, 2nd Edition, 2009 (ISBN 0387952845)
2. Foundations of Data Science, Avrim Blum, John Hopcroft and Ravindran Kannan
3. Data Mining and Analysis: Fundamental Concepts and Algorithms, Mohammed J. Zaki and Wagner Miera Jr. Cambridge University Press, 2014
4. Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber and Jian Pei, 3rd Edition, 2011 (ISBN 0123814790)

VIGNANA BHARATHI®
Institute of Technology

(A UGC Autonomous Institution, Approved by AICTE, Accredited by NBA & NAAC-A Grade, Affiliated to JNTUH)

21IT4173 : BIG DATA TECHNOLOGIES

(Professional Elective – III)

B.Tech. IV Year I Sem.

	L	T	P	C
	3	-	-	3

Prerequisites:
- A knowledge on Database Management Systems.

Course Objectives:
1. To provide the students with the knowledge of Big data Analytics .
2. To provide the students with the knowledge of Big data Technologies.
3. To Impart knowledge on Hadoop
4. To provide knowledge on Hadoop Framework
5. This course is also designed to give an exposure of Data Analytics and Machine Learning

Course Outcomes:
1. Illustrate big data challenges in different domains including social media, transportation, finance and medicine
2. Use various techniques for mining data stream
3. Design and develop Hadoop
4. Identify the characteristics of datasets and compare the trivial data and big data for various applications
5. Explore the various search methods and visualization techniques

UNIT – I
Introduction to big data: Introduction to Big Data Platform, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting.

UNIT – II
Stream Processing: Mining data streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) Applications, Case Studies – Real Time Sentiment Analysis – Stock Market Predictions.

UNIT – III
Introduction to Hadoop: Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analysing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and
Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment.

UNIT – IV
Frameworks and Applications: Frameworks: Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and ZooKeeper.

UNIT – V

Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, multiple linear regression, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application.

TEXT BOOKS:

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'reilly Media, Fourth Edition, 2015.
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.
3. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP, 2012

REFERENCES:

1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley& sons, 2012.
2. Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, "Harness the Power of Big Data: The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.
3. Arshdeep Bahga and Vijay Madisetti, "Big Data Science & Analytics: A Hands On Approach ", VPT, 2016.

21DS4171: SOFTWARE TESTING METHODOLOGIES
(Professional Elective –III)

B.Tech. IV Year I Sem.

L	T	P	C
3	**-**	**-**	**3**

Prerequisites: A course on "Software Engineering".

Course Objectives:
The objective of this course is to:
1. Learn and understand the tools and techniques of software testing and its practice in the industry.
2. Be aware of the differences between the various testing strategies.
3. Know the taxonomy and purpose of software testing tools.
4. Learn path testing, domain testing.
5. Learn the data flow testing.

Course Outcomes:
At the end of the course, students will be able to:
1. Understand the basic concepts of testing, path testing and sensitization2. Generation of test cases from requirements.
2. Learn about the transaction flow testing.
3. Understand the concepts of domain based testing and logic based testing.
4. Describe about the path product and data flow anomaly detection.
5. Understand the concepts of transitions testing.

UNIT - I
Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs. Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT - II
Transaction Flow Testing: transaction flows, transaction flow testing techniques. Dataflow testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing. Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT - III
Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection. Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

UNIT - IV
State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

UNIT - V
Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter orWin-runner).

TEXT BOOKS:
 1. Software testing techniques - Baris Beizer, Dreamtech, second edition.
2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.

REFERENCE BOOKS:
1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley

VIGNANA BHARATHI ®
Institute of Technology

(A UGC Autonomous Institution, Approved by AICTE, Accredited by NBA & NAAC-A Grade, Affiliated to JNTUH)

21CS4174 - CLOUD COMPUTING

B.Tech. IV Year I Sem.

L	**T**	**P**	**C**
3	**-**	**-**	**3**

Pre-Requisites: courses on Computer Networks, Operating Systems, Distributed Systems.

Course Objectives:

1. To explain the evolving computer model called cloud computing.
2. To Understand the current trend and basics of cloud computing
3. To introduce the various levels of services that can be achieved by cloud.
4. To describe the security aspects in cloud.
5. To Learn cloud enabling technologies and its applications

Course Outcomes:

1. Ability to understand various service delivery models of a cloud computing architecture.
2. Ability to understand the virtualization and cloud computing concepts.
3. Able to understand cloud computing architecture and managing cloud infrastructure and its applications.
4. Acquire knowledge on cloud service models.
5. Acquire knowledge on cloud service providers.

UNIT - I
Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT - II
Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models

UNIT - III
Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT - IV
Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service,

Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

UNIT V

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP LaBU, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform

TEXT BOOK:
1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

REFERENCE BOOKS:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

VIGNANA BHARATHI
Institute of Technology ®

(A UGC Autonomous Institution, Approved by AICTE, Accredited by NBA & NAAC-A Grade, Affiliated to JNTUH)

21BU4174 – BLOCK CHAIN TECHNOLOGY

(Professional Elective – III)

B.Tech. IV Year I Sem.

L	T	P	C
3	-	-	3

Prerequisites

- Knowledge in security and applied cryptography;
- Knowledge in distributed databases

Course Objectives:

1. To Introduce block chain technology and Crypto currency
2. To give exposure on Block chain concepts
3. Provide knowledge on Block chain Science
4. To know types of Digital Currency
5. Provide knowledge on technical challenges in Block chain implementation

Course Outcomes:

1. Learn about Block chain technology and Crypto currency.
2. Understand Extensibility of Blockchain concepts
3. Understand and Analyse Block chain Science
4. Understand various Crypto Currency transaction strategies
5. Understand Technical challenges, Business model challenges

UNIT - I

Introduction: Block chain or distributed trust, Protocol, Currency, Cryptocurrency, How a Cryptocurrency works, Crowdfunding

UNIT - II

Extensibility of Blockchain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Blockchain Environment

UNIT - III

Blockchain Science: Gridcoin, Folding coin, Blockchain Genomics, Bitcoin MOOCs

UNIT - IV

Currency, Token, Tokenizing, Campuscoin, Coindrop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency

UNIT - V

Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations

TEXT BOOK:
1. Melanie Swan, Blockchain Blueprint for Economy, O'reilly.

REFERENCE BOOKS:
Building Blockchain Apps, Michael Juntao Yuan, Pearson Education
Daniel Drescher, Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition
Bradley Lakeman, Blockchain Revolution: Understanding the Crypto Economy of the Future. A Non-Technical Guide to the Basics of Cryptocurrency Trading and Investing, ISBN: 1393889158

21BU4175: DATA WAREHOUSING AND DATA MINING
(Professional Elective – IV)

B. Tech IV Year I Semester	L	T	P	C
	3	-	-	3

Course Objective:
1. Study data warehouse principles and its working
2. Passing on knowledge about advanced data mining algorithms and working with complex data representations at various stages of the knowledge discovery process.
3. Understand Association rules mining.
4. Acquiring knowledge about techniques and algorithms of Classification
5. Acquiring knowledge about techniques and algorithms of Clustering

Course Outcome:
1. Students should be able to understand why the data warehouse in addition to database systems.
2. Ability to perform the pre-processing of data and apply mining techniques on it.
3. Ability to identify the association rules, classification and clusters in large data sets.
4. Ability to solve real world problems in business and scientific information using data mining Classification techniques
5. Ability to identify real world problems in business and scientific information using data mining Clustering techniques

UNIT- I
Data warehouse: Introduction to Data warehouse, Difference between operational database systems and data warehouses, Data warehouse Characteristics, Data warehouse Architecture and its Components, Extraction-Transformation-Loading, Logical(Multi-Dimensional), Data Modelling, Schema Design, Star and Snow-Flake Schema, Fact Consultation, Fact Table, Fully Addictive, Semi-Addictive, Non Additive Measures; Fact- Less-Facts, Dimension Table Characteristics; OLAP Cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.

UNIT- II
Introduction to Data Mining: Introduction**,** What is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Pre-processing, Data Cleaning, Missing data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binarization, Data Transformation; Measures of Similarity and Dissimilarity- Basics.

UNIT- III
Association Rules: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIORI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set- Maximal Frequent Item Set, Closed Frequent Item Set.

UNIT- IV
Classification: Problem Definition, General Approaches to solving a classification problem, Evaluation of Classifiers, Classification techniques, Decision Trees-Decision tree Construction,

Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction; Naive-Bayes Classifier, Bayesian Belief Networks; K-Nearest neighbour classification-Algorithm and Characteristics.

UNIT- V
Clustering: Problem Definition, Clustering Overview, Evaluation of Clustering Algorithms**,** Partitioning Clustering-K-Means Algorithm, K-Means Additional issues, PAM Algorithm; Hierarchical Clustering-Agglomerative Methods and divisive methods, Basic Agglomerative Hierarchical Clustering Algorithm, Specific techniques, Key Issues in Hierarchical Clustering, Strengths and Weakness; Outlier Detection.

TEXT BOOKS:
1.Data Mining- Concepts and Techniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers Elsevier 3rd Edition, 2011.
2.Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education

REFERENCE BOOKS:
1. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
2. Data Warehousing Fundamentals, Pualraj Ponnaiah, Wiley Student Edition.
3. The Data Warehouse Life Cycle Toolkit – Ralph Kimball, Wiley Student Edition. Data Mining, Vikaram Pudi, P Radha Krishna, Oxford University Press.

21BU4176 - DIGITAL PAYMENT SYSTEMS
(Professional Elective – IV)

B.Tech. IV Year I Sem.

L	T	P	C
3	-	-	3

Course Objectives:

1. Impart knowledge on various types of Payment Cards and their processing mechanism
2. Know the need of UPI payments and various E-Wallets
3. Discuss the players and processes involved in secure e-payments transactions.
4. Discuss the different categories and potential uses of smart cards.
5. Include topics on EMV^{TM} regulatory framework and ICC architecture

Course Outcomes:

1. Understand the shifts that are occurring with regard to digital payments.
2. Acquire a comprehensive understanding of different tasks associated in usage of digital payment systems.
3. Understand risks involved in e-payments and their counter-measures to provide secure transactions.
4. Understand the need of Card holder verification and issuer authentication in real time transactions.
5. Understand and analyse chip card technology and application processing for digital payment systems.

UNIT - I
Introduction, Magnetic stripe debit and Credit cards, Chip Migration with EMV^{TM}, Remote debit and credit with EMV^{TM}
Payment Card Processing: Roles involved in payment card processing, payment card brands, Credit and debit payment cards, Focusing on the magnetic stripe card, Threats and security protections, Processing at the point of service, Payment network and interchange message, On-line authorization, Clearing and Settlement.

UNIT - II
A business case for chip migration, An overview of the chip card technology, proprietary payment application, interoperable payment application, EMV^{TM} data elements, EMV^{TM} file system, EMV^{TM} application selection.
SMS Payments, USSD Payments, UPI Payments, Mobile Wallets, Bharat Bill Payments, NEFT, IMPS, QR Code, Merchants Payments, Internet Banking & Payments. ATM Payments, Interoperable Payments.

UNIT - III
Certification mechanism and algorithm, Public key certificate for RSA scheme, Entities and certifiers, Entity public key remainder, EMV^{TM} certification chain, Issuing EMV^{TM} public key certificates, Verifying EMV^{TM} public key certificates, issuing signed static application data, Verifying the signed static application data.

UNIT - IV
Overview of the EMV^{TM} debit/credit transaction, Initiate application processing, Read application data, Off-line data authentication, Processing restrictions, Cardholder

Verification, Terminal risk management, Terminal action analysis, On-line processing and issuer authentication.
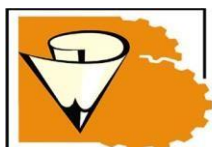
UNIT - V

EMV^{TM} regulatory framework, Deriving ICC specifications by issuers, Selection criteria of the ICC architecture, Multiplication ICC, Issuer's business case, adaptive initiate application processing, Design criteria for CAM selection, Design criteria for CVM, Processing restrictions, Card risk management.

TEXT BOOK:

1. Cristian Radu, Artech House, Implementing Electronic Card Payment Systems, Computer Security Series.

REFERENCE BOOKS:

1. Electronic Payment Systems for E-Commerce by Donal O'Mahony, Michael Peirce and Hitesh Tewari, Artech House, Computer Security Series
2. David A. Buchanan, James McCalman, High Performance Work Systems: The Digital Experience, Routledge
3. David A. Montague, Essentials of Online payment Security and Fraud Prevention, Wiley

21BU4177 - NATURAL LANGUAGE PROCESSING

(Professional Elective – IV)

	L	**T**	**P**	**C**
B.Tech. IV Year I Sem.	**3**	**-**	**-**	**3**

Prerequisites: Data structures, finite automata and probability theory

Course Objectives:
1. Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.
2. Introduce to NLP problems and solutions relation to linguistics and statistics.
3. Introduce to Regular expression and probabilistic model with n-grams.
4. Introduce to Recognizing Speech and parsing with grammar.
5. To learn basis of semantic analysis and discourse analysis.

Course Outcomes:
1. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
2. Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
3. Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
4. Able to design, implement, and analyze NLP algorithms
5. Able to design different language modeling Techniques.

UNIT - I
Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models
Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

UNIT - II
Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

UNIT - III
Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT - IV
Predicate-Argument Structure, Meaning Representation Systems, Software.

UNIT - V
Discourse Processing: Cohesion, Reference Resolution, Discourse Cohesion and Structure
Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modelling Problems, Multilingual and Cross Lingual Language modeling.

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

REFERENCE BOOK:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications

21BU4178 - SOCIAL MEDIA ANALYTICS

(Professional Elective – IV)

B.Tech. IV Year I Sem.

L	T	P	C
3	-	-	3

Course Objectives:
1. To enable students to understand its fundamental concepts of Social Media and Social Networking systems.
2. To understand and analyze social Media analytics and tools.
3. To study its various types of Social Media text analytics.
4. To understand and analyze social Media Actions, Actions Analytics.
5. To study its various types of Hyperlink Analytics, Hyperlink Analytics.

Course Outcomes:
1. The students will be able to understand its fundamental concepts of Social Media and Social Networking systems.
2. The students will be able to gain knowledge on layers of Social Media analytics.
3. The students will be able to apply text analytics tools on Social Media data.
4. The students will be able to know the importance of Social Media action and action analytics.
5. The students will be able to understand and analyse various types of Hyperlink Analytics, Hyperlink Analytics

UNIT - I:
Introduction to Social Media: World Wide Web, Web 1.0, Web 2.0, Web 3.0, Social Media, Core Characteristics of Social Media, Types of Social Media, Social Networking Sites, Using Facebook For Business Purposes, Content Communities.

UNIT- II:
Social Media Analytics Overview: Purpose of Social Media Analytics, Social Media Vs. Traditional Business Analytics, Seven Layers of Social Media Analytics, Types of Social Media Analytics, Social Media Analytics Cycle, Challenges to Social Media Analytics, Social Media Analytics Tools.
Case Study: The Underground Campaign That Scored Big

UNIT - III:
Social Media Text Analytics: Types of Social Media Text, Purpose of Text Analytics, Steps in Text Analytics, Social Media Text Analysis Tools.Case Study: Tapping into Online Customer Opinions

UNIT -IV:
Social Media Actions Analytics: Introduction to Actions Analytics, Common Social Media Actions, Actions Analytics Tools.Case Study: Cover-More Group

UNIT - V:

Social Media Hyperlink Analytics: Types of, Types of Hyperlink Analytics, Hyperlink Analytics Tools.Case Study: Hyperlinks and Viral YouTube Videos

TEXT BOOK:

1. Seven Layers of Social Media Analytics Mining Business Insights from Social Media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, And Location Data by Gohar F. Khan ISBN: 1507823207, Isbn-13: 9781507823200

REFERENCE BOOKS:

1. Social Media Analytics: Techniques and Insights for Extracting Business Value Out of Social Media by Matthew Ganis, AvinashKohirkar, Pearson Education.
2. Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics, Marshall Sponder, MGH.
3. Big DataandAnalytics,Seema Acharya, SubhasininChellappan, Wiley Publications.
4. Big Data, Black Book™, Dreamtech Press, 2015 Edition.

OPEN ELECTIVE-III

21BU4151 - FUNDAMENTALS OF DATA SCIENCE LAB

B. Tech IV Year I Semester

L	T	P	C
-	-	3	1.5

Course Objectives: The course should enable the students to:
1. Understand the R Programming Language.
2. Recollect concepts on Statistics.
3. Reading and Writing different types of Datasets
4. Exposure on Solving data science problems.
5. Understand The classification and Regression Model

Course Outcomes:
1. Illustrate the use of various data structures.
2. Analyze and manipulate Data using Pandas
3. Creating static, animated, and interactive visualizations using Matplotlib.
4. Understand the implementation procedures for the machine learning algorithms.
5. Apply appropriate data sets to the Machine Learning algorithms

LIST OF EXPERIMENTS
1. R AS CALCULATOR APPLICATION
   a) Using with and without R objects on console
   b) Using mathematical functions on console
   c) Write an R script, to create R objects for calculator application and save in a specified location in disk

2. DESCRIPTIVE STATISTICS IN R
   a) Write an R script to find basic descriptive statistics using summary
   b) Write an R script to find suBUet of dataset by using suBUet ()

3. READING AND WRITING DIFFERENT TYPES OF DATASETS
   a) Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location.
   b) Reading Excel data sheet in R.
   c) Reading XML dataset in R.

VISUALIZATIONS
   a) Find the data distributions using a box and scatter plot.
   b) Find the outliers using a plot.
   c) Plot the histogram, bar chart and pie chart on sample data

CORRELATION AND COVARIANCE
   a) Find the correlation matrix.
   b) Plot the correlation plot on dataset and visualize giving an overview of relationships   among data on iris data.
   c) Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data

4. **REGRESSION MODEL**

Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. require (foreign), require (MASS).

5. **MULTIPLE REGRESSION MODEL**

Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset.

6. **REGRESSION MODEL FOR PREDICTION**

Apply regression Model techniques to predict the data on above dataset

7. **CLASSIFICATION MODEL**

a. Install relevant packages for classification.

b. Choose a classifier for classification problems.

c. Evaluate the performance of the classifier.

8. **CLUSTERING MODEL**

a. Clustering algorithms for unsupervised classification.

b. Plot the cluster data using R visualizations.

TEXT BOOKS:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014
2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
3. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

REFERENCE BOOK:

1.Yanchang Zhao, "R and Data Mining: Examples and Case Studies", Elsevier, 1st Edition, 2012

21BU4181 - Mini Project

B.Tech. IV Year I Sem. **L T P C**
- - 4 2

IVYEAR – SEM-II

21MB4213 -HUMAN RESOURCE MANAGEMENT

B.Tech. IV Year II Sem.

L	T	P	C
3	-	-	3

Course Objectives:

1. To understand various functions of HRM and able to manage the human resources of any organization effectively.
2. To Understand basics of Job Analysis and Talent Management Process.
3. To highlight different types of training and development methods
4. To make students aware of components of compensation Management and legislations
5. To Understand Employee Retention Strategies, Importance of Employee welfare and grievance Redressed

Course Outcomes:

1. Understand Fundamentals of HR concepts
2. Understand the process of recruitment and selection
3. To make Students aware of training need analysis and how to design training programs and their Implementation.
4. Students know about employee benefits and employee welfare schemes
5. Understand Employee retention strategies and Importance of Labour Acts to manage Employee Relations.

UNIT - I:
Introduction of HRM: Introduction to HRM – Line Managers – HR Role and responsibilities, New Approaches to Organizing HR – Globalization & Competition Trends – Technological Trends – Trends in Nature of Work – Workforce and Demographic Trends – Economic Challenges – High Performance Work System's – Labour Legislation in India – Equal Employment Opportunity – HR Score Card developed. Human Resource Information System.

UNIT - II:
Recruitment and Selection: Basics of Job Analysis and talent Management process – Methods for Collecting Job Analysis Information – Job Descriptions and specifications – Job Satisfaction– Job Enlargement, Job Enrichment, Job Rotation, HR Planning – Recruitment & Selection Process – Planning & Forecasting of human resources – Sources of Recruitment – Recruitment on Diverse Work Force – Employee Testing and Selection – Basic types of Interviews – Errors in Interviews

UNIT - III:
Training and Developing and Performance Management – Importance of Training and Development – Training process - Analyzing Training needs &Designing the program – Implementation of training programmes – training methods – Management development process – Evaluation of training and development programmes. Performance Management - Concept of Performance management and appraisal, the performance appraisal process, Techniques for Performance Appraisal – Career Management.

UNIT - IV:

Compensation and Employee welfare – Basic factors in determining pay rates – Job evaluation methods - Establishing pay rates – Pricing Managerial and Professional JoBU – Performance based pay -Benefits – Insurance – Retirement Benefits – Employee Welfare facilities. Salient Features of Workmen Compensation Act & Minimum Wages Act.

UNIT - V:

Employee Relations – Labour Movement – Collective Bargaining Process – Grievances – Grievances handling procedure – Employee Separation – Employee Safety and Health – Occupational Safety Law – Work Place Health Hazards Problems & Remedies – Salient features of Industrial Disputes Acts 1947 – Factories Act.

TEXTBOOKS:
1. Gary Dessler, Biju Varkkey, Human Resource Management, 4e, Pearson 2017.
2. Robert L.Mathis, John H.Jackson, Manas Ranjan Tripathy, Human Resource Management, Cengage Learning 2016.
3. Uday Kumar Haldar, Juthika Sarkar, Human Resource Management, Oxford UniversityPress2013.

REFERENCE BOOKS:
1. Aswathappa, Human Resource Management, Text and Cases, TMH, 2011.
2. Sharon Pande and SwapnalekhaBasak, Human Resource Management, Text andCases,Vikas Publishing, 2e, 2015.

21BU4271 - INNOVATION IP MANAGEMENT AND ENTREPRENEURSHIP
(Professional Elective – V)

B.Tech. IV Year II Sem.

L	T	P	C
3	-	-	3

Course Objectives:
1. To develop Entrepreneurship skills of students by enriching knowledge about substantive aspects of management, strategy and legal literature.
2. To discuss intellectual property strategy to protect inventions and innovations of new ventures.
3. The course will make the students understand the different types of IP and make them aware of IP Protection.
4. The course will enable students to strategize IP lifecycle effectively throughout the journey of start-up, in a time when it is aspired highly by the economy and society.
5. Students will learn the fundamentals and advanced strategies of IP. They will be given the opportunity for understanding the same in the MSME sector. They will finally be provided brief exposure about the valuation techniques and audits of IP.

Course Outcomes:
1. Describe the requirements and responsibilities put on management, board members and shareholders in different development situations
2. define the needs for resources as well as obstacles in the early stages of the development of a business
3. independently formulate a business plan based on a business idea in technology
4. students will be able to plan and implement a development project in a team
5. Describe the fundamentals of intellectual property rights and legislation, particularly in the biotech industry.

UNIT - I:
Entrepreneurship: Introduction, Relation between IP and Entrepreneurship, Role of IP identifying threshold innovative entrepreneurs. Innovative entrepreneurship, Opportunity recognition and entry strategies. Competitive advantage through IP protection, IP protection for Start-ups.

UNIT - II:
Innovation: Introduction to innovation, Creativity, Different types of innovation, Open innovation, Adaptability of an innovation, Innovation vs. Invention, Divergent and convergent thinking, Idea generation, Idea validation, Idea protection, Necessity of innovation in current business world.

UNIT - III:
Intellectual Property: Introduction, Traditional knowledge vs. Intellectual Property, Different types of IP, Copyrights, Trademarks, Geographical Indications, Trade secrets, Patents; Transforming IP into Economy; IP protection in developed nations, and developing

nations. Position of India in IP protection (Agriculture, Pharmaceutical and engineering sectors).

UNIT - IV:

IPR and Technical Inventions: Patent, Patentability requirements, Patent drafting, Patent lifecycle; Software Patents: Design Patents; Protection of Various aspects of Embodied Inventions; Integrated circuit designs protection; Software Inventions or algorithms: Copyright vs Patent.

UNIT - V:

IP strategy and Entrepreneurship: IP strategy for start-up and MSME, IP transaction, IP valuation, Government Initiatives: Incubators, research parks, Various Government policies, Integrative approach – Entrepreneurship & IP strategy, Fee relaxations for patents for Start-ups and small entities.

TEXT BOOKS:
1. Ove Granstrand, The Economic and management of Intellectual Property, (1999)
2. Narayanan, V. K., Managing technology and innovation for competitive advantage, first edition, Pearson education, New Delhi, (2006)
3. Idris, K. (2003), Intellectual property: a power tool for economic growth, second edition, WIPO publication no. 888, Switzerland
4. Bosworth D. &WeBUter E, The Management of Intellectual Property, Edward Elgar.

REFERENCE BOOKS:
1. Berman, Ideas to Assets, Wiley publications
2. Richard Dorf& Thomas Byers, Technology ventures from idea to enterprise, 2 nd edition.

ADDITIONAL READING: WIPO - http://www.wipo.int/patents/en/

21IT4271: DEEP LEARNING
(Professional Elective – V)

B.Tech IV Year II Sem.

L	T	P	C
3	-	-	3

Prerequisite(s):
Artificial Intelligence

Course Objectives
Develop ability to
1. Understand various learning models.
2. Learn feed forward neural networks for learning
3. Learn to use auto encoders and regularization
4. Understand Convolution Neural Networks for learning
5. Understand Recurrent Neural Networks for learning

Course Outcomes (COs)
1. Analyze various learning models.
2. Use feed forward neural networks for learning
3. Highlight the importance of auto encoders and regularization
4. Apply Convolution Neural Networks for learning
5. Apply Recurrent Neural Networks for learning

UNIT-I
Introduction- Historical Trends in Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Perceptron, Perceptron Learning Algorithm. Representation Power of MLPs, Sigmoid Neurons, Gradient Descent, Feed forward Neural Networks, Representation Power of Feed forward Neural Networks
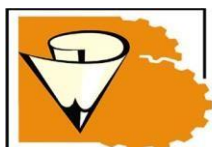
UNIT-II
Feed Forward Neural Networks- Back propagation, Gradient Descent (GD), Momentum Based GD, NesterovAccelerated GD, Stochastic GD, AdaGrad, RMS Prop, Adam, Eigenvalues and Eigenvectors, Eigenvalue Decomposition, Basis Principal Component Analysis and its interpretations, Singular Value Decomposition

UNIT-III
Auto encoders- relation to PCA, Regularization in auto encoders, Denoising auto encoders, Sparse auto encoders, Contractive auto encoders, Regularization: Bias Variance Tradeoff, L2 regularization, early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout, Greedy Layer wise Pre-training, Better activation functions, better weight initialization methods, Batch Normalization.

UNIT-IV
Convolutional Neural Network- The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Innitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types. LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Back propagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks

UNIT– V

Recurrent Neural Networks-Back propagation through time (BPTT), Vanishingand Exploding
Gradients, Truncated BPTT, GRU, LSTMs, Encoder Decoder Models, Attention Mechanism, Attention over images

TEXTBOOK(S)

1. Goodfellow. I., Bengio.Y. and Courville.A., " Deep Learning", MITPress, 2016.

REFERENCE BOOK(S)

1. Ragav Venkatesan, Baoxin Li, "Convolutional Neural Networks in Visual
   Computing", CRC Press, 2018.
2. Navin Kumar Manaswi, "Deep Learning with Applications Using Python", A press,
   2018.
3. John D Kelleher "Deep Learning" (The MIT Press Essential Knowledge series) The
   MIT Press,2019.
4. Daniel Graupe "Deep Learning Neural Networks: Design and Case Studies", World
   Scientific Publishing Co Pte Ltd, 2016.
5. Rajiv Chopra "Deep Learning", Khanna Book Publishing ,2018.

21BU4273 - IMAGE PROCESSING
(Professional Elective – V)

B.Tech. IV Year II Sem.

L	T	P	C
3	-	-	3

Pre-requisites:

- Students are expected to have knowledge in linear signals and systems, Fourier Transform,
  basic linear algebra, basic probability theory and basic programming techniques;
  knowledge of Pre-processing and data enhancement
  Digital Signal Processing is desirable.
- A course on "Computational Mathematics"
- A course on "Computer Oriented Statistical Methods"

Course OBJECTIVES:

1. Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts
2. Provides the knowledge of image acquisition, sampling and quantization.
3. To know Preprocessing and enhancement.
4. Know Image restoration, and segmentation.
5. To gain Knowledge of different image compression techniques.

COURSE OUTCOMES:

1. Understand the theoretical and mathematical foundations of Digital Image Processing.
2. Explain different image acquisition, sampling and quantization methods.
3. Perform Preprocessing and image enhancement operations on given images.
4. Apply different Image restoration, and segmentation techniques
5. Perform different image compression techniques.

UNIT - I
Digital Image Fundamentals: Digital Image through Scanner, Digital Camera. Concept of Gray Levels. Gray Level to Binary Image Conversion. Sampling and Quantization. Relationship between Pixels. Imaging Geometry. 2D Transformations-DFT, DCT, KLT and SVD.

UNIT - II
Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering, Enhancement in Frequency Domain, Image Smoothing, Image Sharpening.

UNIT - III
Image Restoration Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT - IV

Image Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation.

UNIT - V

Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

TEXT BOOK:

1. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/ Pearson Education, 2nd Ed, 2004.

REFERENCE BOOKS:

1. Fundamentals of Digital Image Processing: A. K. Jain, PHI.
2. Digital Image Processing using MAT LAB: Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins: Pearson Education India, 2004.
3. Digital Image Processing: William K. Pratt, John Wilely, 3rd Edition, 20

21BU4274 – DEVOPS

(Professional Elective – V)

B.Tech. IV Year II Sem.

L	T	P	C
3	-	-	3

Course Objectives: The objective of this course is to:

1. To describe the agile relationship between development and IT operations.
2. To understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
3. To implement automated system update and DevOps lifecycle.
4. To illustrate the types of version control systems, continuous integration tools, continuous monitoring tools.
5. To analyze the concepts of test automation and deployment automation.

Course Outcomes: At the end of the course, student will be able to:

1. Identify components of Devops environment.
2. Describe Software development models and architectures of DevOps.
3. Apply different project management, integration and testing tools.
4. Apply different code deployment tools.
5. Assemble and adopt Devops in real-time projects.

UNIT - I
Introduction: Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT - II
Software development models and DevOps: DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing.
DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

UNIT - III
Introduction to project management: The need for source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT - IV
Integrating the system: Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

UNIT - V
Testing Tools and automation: Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development

Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker

TEXT BOOKS:
1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN-10: 1788392574
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

REFERENCE BOOK:
1. *Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10.*

21BU4275 - FINANCIAL MODELING
(Professional Elective – VI)

B.Tech. IV Year II Sem.

L	T	P	C
3	-	-	3

Course Objectives:
1) Its general objective is to develop spreadsheet and management skills for creating computer-based models in financial modelling process.
2) The course helps in analyzing a variety of decision problems facing today's financial managers and professionals.
3) To know about fixation of optimal financial structure for business development.
4) The course concept is covered with the help of case studies and simulation with real market data.
5) To analyze benefits and challenges of Risk modelling

Course Outcomes:
1. Understand basic concepts of Financial Statement Analysis, Cash flows and Valuation Modelling.
2. Understand and analyze Corporate Finance Models
3. Understand various portfolio models
4. Analyze risk modelling and Visual Basic For Application
5. Analyze the simulation techniques in risk modelling.

UNIT -I
Financial Statement Analysis, Cash flows and Valuation Modelling: Income statement Analysis, Balance sheet Analysis, Cash flow Statement Analysis and Forecasting, Terminal value Calculations-the use of fade periods, the return on capital, and valuation of a perpetuity, sensitivity analysis-long term growth and economic profit assumption.

UNIT - II
Corporate Finance Models: Basic financial calculation - PV, NPV, IRR, MIRR, and Flat payment schedules, Cost of Capital- Cost of Equity, Cost of Debt, and WACC.

UNIT – III
Dividend Decisions theories-Walters Model-Gordon Model, Miller -Modigliani theories-Effect of Dividend policy on Share value of firm- Valuation of Firm, Security Market line, CAPM.

UNIT - IV
Portfolio Models: Introduction, portfolio mean and variance, efficient portfolios, capital market line, SML, Variance-covariance Matrix, Convertibility, MBA/CMO and other bonds-Convertible bonds, Mortgage Based Securities, CMO- Collaterized Mortgage Obligation, Managing a CMO Portfolio.

UNIT – V
Risk Modelling: Benefits and challenges of risk modelling, the risk modelling process, Introduction to Simulation Techniques, Value at Risk-Delta Normal Methodology, Historical Simulation Methodology, Monte Carlo Simulation Methodology, and Extreme Value Theory.

Visual Basic for Application: User defined function with VBA, Using Excell functions in VBA, Types and Loops, Macros and users interaction, Arrays, Objects and Add-Ins.

TEXT BOOKS
1. Michael Rees: Financial Modelling in practice-A concise guide for intermediate and advance level, Willey a John Wiley and sons Ltd. Publication, 2008.
2. Simon Benninga: Financial Modelling, 3/e, the MIT Press London, 2008.

REFERENCE BOOK:
1. Thomas S.Y.Ho and Sang Bin Lee: The Oxford guide to Financial Modelling-Application for capital markets, corporate finance, Risk Management and financial Institutions, Oxford University Press, 2004.

21BU4276 - DECISION SUPPORT SYSTEMS
(Professional Elective – VI)

B.Tech. IV Year II Sem.

L	T	P	C
3	-	-	3

Course objectives:
1. To introduce decision support systems
2. Inculcate Decision Styles for Decision making systems
3. Show their relationship to other computer-based information systems, demonstrate DSS development approaches.
4. Provide knowledge on MSS modelling
5. Show students how to utilize DSS capacities to support different types of decisions.

Course Outcomes:
1. Understand the decision-making process.
2. Perform decision analysis and modelling.
3. Develop a DSS and Analyze the role of knowledge management in DSS.
4. Understand knowledge-based system and knowledge engineering.
5. Design Advanced Intelligent Systems.

UNIT - I
Decision Making and Computerized Support: Computerized Decision Support and the Supporting Technologies; A Framework for Decision Support; The Concept of Decision Support Systems and Decision support systems applications

UNIT - II
Decision-Making Systems, Modelling, and Support Decision-Making: Introduction and Definitions; Systems; Models; Phases of the Decision- Making Process; The Intelligence Phase; The Design Phase; The Choice Phase; The Implementation Phase; How Decisions Are Supported; Personality Types, Gender, Human Cognition, and Decision Styles; The Decision-Makers

UNIT - III
Decision Support Systems: An Overview DSS Configurations; What Is a DSS?; Characteristics and Capabilities of DSS; Components of DSS; The Data Management Subsystem; The Model Management Subsystem ; The User Interface (Dialog) Subsystem, The Knowledge-Based Management Subsystem ; The User; DSS Hardware; DSS Classifications\

UNIT - IV
Modelling and Analysis: MSS Modelling; Static and Dynamic Models; Certainty, Uncertainty, and Risk; Influence Diagrams; MSS Modelling with Spreadsheets; Decision Analysis of a Few Alternatives (Decision Tables and Decision Trees); The Structure of MSS Mathematical Models; Mathematical Programming Optimization; Multiple Goals, Sensitivity Analysis, What-If, and Goal Seeking; Problem-Solving Search Methods

UNIT - V

Decision Support System Development: Introduction to DSS Development; The Traditional System Development Life Cycle; Alternative Development Methodologies; Prototyping: The DSS Development Methodology; Change Management; DSS Technology Levels and Tools; DSS Development Platforms; DSS Development Tool Selection; Team-Developed DSS; End User Developed DSS.

TEXT BOOKS:

1. Efraim Turban and Jay E. Aronson. Decision Support Systems and Intelligent Systems, 8th edition, Prentice Hall, 2007
2. Burstein F., Holsapple C.W. (eds.) Handbook on Decision Support Systems, Springer, 2008

REFERENCE BOOKS:

1. Decision Management Systems: A Practical Guide to Using Business Rules and Predictive Analytics, 1 edition (October 10, 2011), by James Taylor. IBM Press;
2. Decision Support Systems, 2nd Edition, by George Marakas, Prentice-Hall, 2003. aking Hard Decisions, 2nd Edition, Robert Clemen, Duxbury, 2001.
3. Understanding Decision Support Systems and Expert Systems, by Efrem Mallach, Irwin, 1994.
4. Value-Focused Thinking: A Path to Creative Decision making, Ralph L. Keeney, Harvard University Press, 1996.
5. Decision Support Systems Hyperbook, Power, D.J., accessed August, 2006

21BU4277 - ADHOC AND SENSOR NETWORKS

(Professional Elective – VI)

B.Tech. IV Year II Sem.

L	T	P	C
3	-	-	3

Prerequisites
- A course on "Computer Networks"
- A course on "Mobile Computing"

Course Objectives
1. To understand the concepts of sensor networks
2. To understand the MAC and transport protocols for ad hoc networks
3. To understand the security of sensor networks
4. To understand the applications of adhoc and sensor networks
5. To Understand the transport layer and security issues possible in Ad hoc and Sensor networks

Course Outcomes
1. Ability to understand the state-of-the-art research in the emerging subject of Ad Hoc and Wireless Sensor Networks
2. Ability to solve the issues in real-time application development based on ASN.
3. Ability to conduct further research in the domain of ASN
4. Ability to understand the transport layer and security issues possible in Ad hoc and sensor networks.
5. Acquire knowledge on upper layer issues of WSN.

UNIT - I
Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs and challenges of MANETs. Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topologybased routing algorithms-Proactive: DSDV; Reactive: DSR, AODV; Hybrid: ZRP; Position-basedrouting algorithms-Location Services-DREAM, Quorum-based; Forwarding Strategies: GreedyPacket, Restricted Directional Flooding-DREAM, LAR.

UNIT - II
Data Transmission - Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. **Multicasting:** Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP;Hybrid: AMRoute, MCEDAR.

UNIT - III
Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR.TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc.

UNIT - IV
Basics of Wireless, Sensors and Lower Layer Issues: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

UNIT - V
Upper Layer Issues of WSN: Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN – 981–256–681–3.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Eseview Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

21BU4278 - ENTERPRISE RESOURCE PLANNING
(Professional Elective – VI)

B.Tech. IV Year II Sem.

L	T	P	C
3	-	-	3

Course Objectives:
1. To provide a contemporary and forward-looking view on the theory and practice of Enterprise Resource Planning Technology.
2. To focus on a strong emphasis upon practice of theory in Applications and Practical Oriented approach.
3. To train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth.
4. To train the students the methodology and implementation of ERP
5. To aim at preparing the students technologically competitive and make them ready to self-upgrade with the higher technical skills.

Course Outcomes:
1. Make basic use of Enterprise software, and its role in integrating business functions
2. Analyze the strategic options for ERP identification and adoption.
3. Design the ERP implementation strategies.
4. Create reengineered business processes for successful ERP implementation.
5. Integration of ERP into organization culture

UNIT - I
ERP Introduction, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP. Integrated Data Model. Scope – Technology – Benefits of ERP: Reduction in cycle Time, Lead Time & Cost, Improved Resource Utilization, Supplier Performance. Flexibility, Accuracy & Decision Making, Customer Satisfaction & On-time Shipment.

UNIT - II
Business Process Reengineering, Management Information system, Decision Support System, Executive Information System. Data ware Housing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management (PLM), LAP, Supply chain Management.

UNIT - III
ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP-Modules: Functional Modules, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications, Manufacturing and logistics modules.

UNIT -IV
ERP Implementation: Implementation Life Cycle -Implementation Methodology - Hidden Costs - Organizing Implementation - Vendors, Consultants and Users Contracts-Project Management and Monitoring- Role of SDLC/SSAD.

UNIT - V
ERP & E-Commerce, Difference between ERP and E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Importance Of Vendors, Consultants And End Users In Developing ERP.

TEXT BOOKS
1. Vinod Kumar Garg and Venkata Krishnan N K, "Enterprise Resource Planning Concepts and Practice", PHI.
2. Joseph A Brady, Ellen F Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Thompson Course Technology.

REFERENCE BOOKS
1. Alexis Leon, "ERP Demystified", Tata McGraw Hill
2. Rahul V. Altekar "Enterprise Resource Planning", Tata McGraw Hill,
3. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – A Concepts and Practice", PHI
4. Mary Summer, "Enterprise Resource Planning"- Pearson Education

21BU4281 -Major Project

B.Tech. IV Year II Sem.

L	T	P	C
-	-	20	10