MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS

Scheme of Instruction and Examination

(Choice Based Credit System)

V SEMESTER

S. No	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	MS502HS	Financial Management	3	0	0	40	60	3	3
2	CS502PC	Computer Networks	3	0	0	40	60	3	3
3	CB501PC	Web Technologies	3	1	0	40	60	3	4
4		Professional Elective – I	3	0	0	40	60	3	3
5		Professional Elective – II	3	0	0	40	60	3	3
6	CS551PC	Computer Networks Lab	0	0	2	40	60	3	1
67	CB551PC	Web Technologies Lab	0	0	2	40	60	3	1
8	EN551HS	Advanced English Communication Skills Laboratory	0	0	2	40	60	3	1
9	CS553PC	UI design – Flutter	0	0	2	40	60	3	1
10	MC501HS	Intellectual Property Rights	3	0	0	40	60	3	0
11	MC501ES	Cyber Security	3	0	0	40	60	3	0
Total Hours / Marks / Credits			**21**	**01**	**08**	**440**	**660**	**--**	**20**

VI SEMESTER

S. No	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	IT601PC	Automata Theory and Compiler Design	3	0	0	40	60	3	3
2	IT602PC	Algorithm Design and Analysis	3	0	0	40	60	3	3
3	MS601HS	Marketing Management and Research	3	0	0	40	60	3	3
4		Professional Elective – III	3	0	0	40	60	3	3
5		Open Elective-I	3	0	0	40	60	3	3
6	MC601ES	Artificial Intelligence	3	0	0	40	60	3	0
7	CB651PC	Algorithms and Compiler Design Lab	0	0	3	40	60	3	1.5
8		Professional Elective-III Lab	0	0	3	40	60	3	1.5
9	CB652PC	Industrial Oriented Mini Project	0	0	4	-	100	3	2
Total Hours / Marks / Credits			**18**	**0**	**10**	**320**	**580**	**--**	**20**
10	MC601BS	Environmental Science (For Lateral Entry Students)	3	0	0	40	60	3	0

L: Lecture **T**: Tutorial **D**: Drawing **P**: Practical **CIE** - Continuous Internal Evaluation **SEE** - Semester End Examination

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS

Scheme of Instruction and Examination

(Choice Based Credit System)

VII SEMESTER

S. No	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	ME731PC	Optimization Techniques	3	0	0	40	60	3	3
2	CB701PC	Data Analytics	3	0	0	40	60	3	3
3		Professional Elective –IV	3	0	0	40	60	3	3
4		Professional Elective –V	3	0	0	40	60	3	3
5		Open Elective – II	3	0	0	40	60	3	3
6	CB751PC	Data Analytics Lab	0	0	2	40	60	3	1
7	ME761PC	Optimization Techniques Lab	0	0	2	40	60	3	1
8	CB752PC	Project Stage – I	0	0	6	100	-	-	3
Total Hours/Marks/Credits			**15**	**0**	**10**	**380**	**420**	**-**	**20**

VIII SEMESTER

S. No	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	MS802HS	Human Resource Management	3	0	0	40	60	3	3
2		Professional Elective – VI	3	0	0	40	60	3	3
3		Open Elective-III	3	0	0	40	60	3	3
4	CB851PC	Project Stage – II including Seminar	0	0	22	40	60	-	11
Total Hours / Marks / Credits			**9**	**0**	**22**	**160**	**240**	**-**	**20**

L: Lecture **T**: Tutorial **D**: Drawing **P**: Practical CIE - Continuous Internal Evaluation SEE - Semester End Examination

MC - Environmental Science – Should be Registered by Lateral Entry Students Only.MC –Satisfactory/Unsatisfactory

Grand Total of Credits

Semester	I	II	III	IV	V	VI	VII	VIII	Total Credits
Credits	20	20	20	20	20	20	20	20	160

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS

List of Professional Electives Offered:

Professional Elective-I

MS511PE	Legal Aspects of Business and Ethics
MS512PE	Financial Modeling
CB511PE	Data Warehousing and Data Mining
CB512PE	E-Commerce
CB513PE	Design Patterns

Professional Elective – II

MS513PE	Behavioral Economics
MS514PE	Enterprise Resource Planning
CB521PE	Distributed Systems
CB522PE	Business Intelligence
CB523PE	Cloud Computing

Professional Elective – III

CS632PE	Internet of Things
CB631PE	R Programming
CB632PE	Machine Learning
CB633PE	Devops
CB634PE	Advanced Data Structures

 # Courses in PE - III and PE - III Lab must be in 1-1 correspondence

Professional Elective – III Lab

CB611PE	Internet of Things Lab
CB612PE	R Programming Lab
CB613PE	Machine Learning Lab
CB614PE	Devops Lab
CB615PE	Advanced Data Structures Lab

Professional Elective – IV

MS711PE	Logistics & Supply Chain Management
MS712PE	Digital Marketing
CD741PE	Natural Language Processing
CB741PE	Big Data Analytics
CB742PE	Software Testing Methodologies

Professional Elective – V

MS713PE	Services Science and Service Oriented Management
CB751PE	Digital Payment Systems
CB752PE	Image Processing
CB753PE	Social Media Analytics
CS754PE	Blockchain Technology

Professional Elective – VI

MS811PE	Innovation IP Management and Entrepreneurship
CS863PE	Deep Learning
CB861PE	Decision Support Systems
CB862PE	Data Visualization Techniques
CB863PE	Service Oriented Architectures

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS

List of Open Electives Offered:

Open Elective – I :

IT611OE	Java Programming
IT612OE	Object Oriented Programming using C++

Open Elective – II :

MS721OE	Enterprise Resource Planning
IT722OE	Scripting Languages

Open Elective – III :

MS831OE	Innovation IP Management and Entrepreneurship
IT831OE	Introduction to Big Data Technologies

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
MS502HS: FINANCIAL MANAGEMENT

(Computer Science & Business Systems)

Course Objectives: The objectives of the course are:

1. To develop a broad understanding of the Concept of Finance Functions and Time value of money.
2. To learn the significance of Capital Budgeting techniques for the feasibility of projects.
3. To understand the capital structure decisions taken by a finance manager in a Corporate.
4. To develop knowledge on dividend policy decision and its relevance
5. To give insights about the importance of Working Capital Management and the tools to manage it.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand Goals of financial function.
2. Identify the significance of Investment criteria and decision process.
3. Understand and analyze capital structure.
4. Implement the Dividend Decisions in the interest of the stakeholders.
5. Assess Working Capital requirements and Understand Asset-Liability management.

UNIT- I: THE FINANCE FUNCTION

Nature and Scope; Evolution of finance function – Its new role in the contemporary scenario – Goals of finance function – maximizing vs. satisfying; Profit vs. Wealth vs. Welfare; the Agency relationship and costs; Risk-Return trade off; Concept of Time Value of Money – Future Value and Present value and the basic valuation model.

UNIT - II: THE INVESTMENT DECISION

Investment decision process- Project generation, project evaluation, project selection and project Implementation. Developing Cash Flow; Data for New Projects; Capital Budgeting Techniques Traditional and DCF methods. The NPV vs. IRR Debate; Approaches for reconciliation.

UNIT- III: FINANCING DECISIONS

Capital structure vs. financial structure - Capitalization, financial leverage, operating leverage and composite leverage. EBIT-EPS Analysis, Capital structure Theories –The Modigliani Miller Theory, NI, NOI Theory and Traditional Theory –A critical appraisal.

Cost of Capital**:** Concept and measurement of cost of capital, Debt vs. Equity, cost of equity, preference shares, equity capital and retained earnings, weighted average cost of capital and marginalcost of capital.

UNIT- IV: DIVIDEND DECISIONS

Dividend Decisions: Dividends and value of the firm - Relevance of dividends, Factors determining Dividend Policy - dividends and valuation of the firm - the basic models – forms of dividend. Declaration and payment of dividends, Bonus shares, Rights issue, share-splits, Major forms of dividends – Cash and Bonus shares. Dividends and valuation models: Gordon, Walter, MM and Lintner. A brief discussion on dividend policies of Indian companies.

UNIT - V: WORKING CAPITAL MANAGEMENT

Components of working capital, gross vs. net working capital, determinants of working capital needs, the operating cycle approach.

Management of Current Assets**:** Management of cash – Basic strategies for cash management, cash planning, cash budget, cash management techniques/processes.

Marketable securities: characteristics, selection criterion Management of receivables- Credit policy, credit evaluation of individual accounts, monitoring receivables, factoring.

Management of inventory- Inventory management process, Inventory control systems, analysis of investment in inventory.

******The students need a Discounting Table and Annuity tables for the examination.

TEXT BOOKS:

1. Pandey I.M, Financial Management, 12e, Vikas Publications, 2021.
2. Khan. M.Y.Jain P.K, Financial Management-Text and Problems, 8e, TMH, 2018.
3. James C Van Horne, Sanjay Dhamija, Financial Management and Policy, 12e, Pearson Education, New Delhi, 2012.

REFERENCE BOOKS:

1. Eugene F. Brigham Michael C. Ehrhardt, Financial Management, 15e, Cengage Learning, 2017.
2. Arindam Banerjee, Financial Management, Oxford Publications, 2016.
3. Rajesh Kothari, Financial Management A Contemporary Approach, 1e, Sage publications, 2017.

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
CS502PC: COMPUTER NETWORKS
(Common to CSE, CSBS, CSE(AI&ML), CSE (Data Science))

Course Objectives:

- The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
- Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

Course Outcomes

- Gain the knowledge of the basic computer network technology.
- Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
- Identify and analyze various routing algorithms, congestion control algorithms.
- Outline the transport layer protocols like TCP and UDP.
- List and examine the applications of HTTP, WWW, DNS, Email, FTP and the underlying protocols.

UNIT - I

Network Hardware: Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Internetwork. Network software: Protocol Hierarchies, Design Issues for the Layers, Connection-Oriented and Connectionless Services. **Reference Models:** OSI, TCP/IP Reference models, Comparison of OSI and TCP/IP Models Example Networks: ARPANET, Internet. **Physical Layer: Guided Transmission media:** Magnetic Media, Twisted pairs, Coaxial Cable, Fiber Optics, Unguided Transmission Media: Radio waves, Microwaves, Infrared.

UNIT - II

Data link layer: Design issues, Framing: Character Count, Character Stuffing, Bit Stuffing Error Detection and Correction: Block Codes, Simple Parity Check, LRC, Hamming Distance, Checksum, Hamming Code, CRC, **Elementary data link protocols:** simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel. **Sliding Window protocols:** Pipelining, Piggybacking, A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, **Medium Access sub layer:** The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Connecting devices at the data link layer.

UNIT - III

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Link State Routing, **Congestion Control Algorithms:** Approaches to Congestion Control, Traffic aware routing, Admission Control, Traffic throttling, Load shedding. **Quality of Service:** Traffic Shaping, Packet scheduling, Admission Control, Integrated services, Differentiated Services, Internetworking, **Network layer in the Internet:** IPv4 protocol, IP Addresses, IPv6 protocol, Internet Control Protocols: ICMP, ARP, RARP, BOOTP, and DHCP.

UNIT - IV

Transport Layer: Transport Services: Services provided to Upper layer, Transport service primitives, Berkeley Sockets Elements of Transport protocols: Addressing, Error and Flow Control, Multiplexing, Crash Recovery, Connection management. **Internet Transport Protocols: TCP:** Service Model, TCP Protocol, Segment header, TCP Connection establishment and Release, TCP Connection management, TCP Sliding Window, Timer management, TCP Congestion Control. **UDP:** Protocol, UDP Header

UNIT - V

Application Layer: Domain name system- DNS Name Space, Resource records, Name Servers. SNMP, **Electronic Mail:** Architecture and Services, User Agent, Message Formats, Message Transfer, Final Delivery. SMTP, POP3, ICMP. **File transfers:** FTP, TFTP, Telnet.

TEXT BOOKS:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI, 2011.
2. Data Communications and Networking – Behrouz A. Forouzan. Fifth Edition TMH, 2017.

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. “Data and Computer Communications” by William Stallings 9th Edition, Pearson Education 2010.TCP/IP Illustrated” by W. Richard Stevens, Addison-Wesley Professional 2nd edition 2011.

L	T	P	C
3	1	0	4

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
CB501PC: WEB TECHNOLOGIES
(CSBS)

Course Objectives:

- Understanding the scripting language and client-side programming
- Understanding XML processing and document object model
- Understanding Server-side programming with Java Servlets, JSP and server-side programming using PHP
- Introduction of JDBC and database connectivity

Course Outcomes:

1. Understanding HTML,CSS and XML
2. Understanding client side scripts for validation of forms using JavaScript
3. Understanding server side programming using Servlets and JSP's
4. Understanding server side programming using PHP.
5. Ability to Create applications for database connectivity using JDBC

UNIT- I

Client-side Scripting - I: HTML Common tags- List, Tables, images, forms, Frames; **Cascading Style sheets; XML:** Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Scheme, XHTML Parsing XML Data – DOM and SAX Parsers in java.

UNIT – II

Client-side Scripting-II: Introduction to Javascript, Javascript language – declaring variables, scope of variables, functions. event handlers (onclick, onsubmit etc.), Form validation.

UNIT- III

Server-Side Programming-I: Servlets: Introduction to Servlets, Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a servlet, The Servlet API, Initialization and Reading Servlet parameters, Handling Http Request & Responses.

JSP: Introduction to JSP, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages.

UNIT – IV

Server-Side Programming-II:

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Handling sessions and cookies

UNIT – V

JDBC: Introduction to SQL. Relational Database concepts. Designing a sample web database. Primary keys in database tables. SQL statements: SELECT and INSERT, UPDATE and DELETE.

Creating a database. Accessing a database through PHP. Inserting data into the Database. Retrieving data from the Database. Usage of sub queries. Updating, adding and deleting records.

TEXT BOOKS

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill

REFERENCE BOOKS

1. Web Programming, building internet applications, Chris Bates 2nd″ edition, Wiley Dreamtech
2. Java Server Pages —Hans Bergsten, SPD O'Reilly,
3. Java Script, D. Flanagan
4. Beginning Web Programming-Jon Duckett WROX.
5. Programming world wide web, R. W. Sebesta, Fourth Edition, Pearson.
6. Internet and World Wide Web — How to program. Dietel and Nieto, Pearson.

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
MS511PE: LEGAL ASPECTS OF BUSINESS AND ETHICS (Professional Elective -I)
(Computer Science & Business Systems)

Course Objectives: The objectives of the course are:

1. To understand the Legal and Regulatory Framework for doing business in India.
2. To learn the various aspects of company law and Indian Contract Act including Sale of Goods Act.
3. To understand about the different types of Negotiable Instruments and various ways of their endorsements; also to introduce the concept of GST.
4. To learn the importance of Ethics in Business.
5. To understand Legal Aspects of Cyber Crime.

Course Outcomes: After completion of the course, students will be able to understand:

1. Broad aspects of Companies Act, 2013.
2. Significant provisions of Indian Contract Act, 1872 and Sale of Goods Act, 1930.
3. The types of negotiable instruments and ways of endorsements and also the concept of GST.
4. Business ethics, and theories and principles of ethics.
5. Legal landscape of cyber law.

UNIT – I: COMPANIES ACT, 2013

Steps and procedure for incorporation of the company, Appointment of Directors, Powers, duties, & liabilities of Directors, Role of Board of Directors and Independent Directors, Company Meetings, Resolutions, Winding-up of a Company.

UNIT – II: **LAW OF CONTRACT**

Nature of Contract and Essential elements of valid contract, Offer and Acceptance, Consideration, Capacity to contract and Free Consent, Legality of Object. Unlawful and illegal agreements, Contingent Contracts, Performance and discharge of Contracts, Remedies for breach of contract. Contracts-II: Indemnity and guarantee, Contract of Agency, Sale of goods Act -1930: General Principles, Conditions & Warranties, Performance of Contract of Sale.

UNIT – III: **NEGOTIABLE INSTRUMENTS ACT - 1881**

Negotiable Instruments- Promissory Note, Bills of Exchange, & Cheque, and their definitions and characteristics, Types of endorsements, Holder- Holder in due course, Discharge of Parties. Introduction to Goods and Services Tax (GST).

UNIT – IV: **BUSINESS ETHICS**

The Changing Environment: Business Ethics-why does it matter? ; Levels of Business Ethics-Five Myths about Business Ethics-can Business Ethics be taught and trained? Stages of Moral development Kohlberg's study-carol Gilligan's Theory-Principles of Ethics.

UNIT – V: CYBER CRIME

The Legal Landscape - Need for cyber laws in the Indian context - The Indian IT Act, 2000 - Challenges to Indian Law and cyber crime scenario in Indian – issues and Challenges in Cyber Crime - recent developments in Cyber Law.

TEXT BOOKS:

1. Ravinder Kumar, Legal Aspects of Business, 6e, Cengage Learning, 2023.
2. CSV Murthy, Business Ethics (Text and Cases), Pub. By HPH.
3. Nina Godbole & Sunit Belapure, Cyber Security, Wiley India, 2012.

REFERENCE BOOKS:

1. RSN Pillai, Bagavathi, Legal Aspects of Business, S. Chand, 2016.
2. Marianne M. Jennings, Cases in Business Ethics, Pubby Cengage Learning.
3. Vakul Sharma, Information Technology Law and Practice, 3e, Universal Law Publishing, 2011.

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
MS512PE: FINANCIAL MODELLING (Professional Elective -I)
(Computer Science & Business Systems)

Course Objectives: The objectives of the course are:

1. To provide basic concepts of finance statement.
2. To focus on a strong emphasis upon valuation analysis.
3. To train the students to develop financial models.
4. To aim at preparing the students technologically competitive in analyzing risk modelling.
5. To train students develop basic in visual development of application.

Course Outcomes: After completion of the course students will be able to:

1. Understand basic concepts of Financial Statement Analysis.
2. Analyze Cash Flow Statements and Valuation Analysis.
3. Evaluate and analyze corporate finance models.
4. Create various portfolio models.
5. Design risk modelling through Visual Basic.

UNIT – I: FINANCIAL STATEMENT ANALYSIS, CASH FLOWS ANDVALUATION 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, 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, Flat payment schedules, Cost of Capital- Cost of Equity, Cost of Debt, WACC, Dividend Decisions-Gordon Model, Miller -Modigliani theories, Security Market line, CAPM.

UNIT – III: PORTFOLIO MODELS

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

UNIT – IV: 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, Extreme Value Theory.

UNIT – V: VISUAL BASIC FOR APPLICATION

User defined function with VBA, Using excel functions in VBA, Types and Loops, Macros and user's 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. 2008.
2. Simon Benninga: Financial Modelling, 3/e, the MIT Press London, 2008.
3. Chandan Sengupta, Financial Analysis and Modelling Using Excel and VBA, 2e, Wiley, 2009.

REFERENCE BOOKS:

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.
2. Simon Benninga - Financial Modelling 4th edition**,** MIT Press, London, 2014**.**
3. Paul Pignataro, Financial Modelling and Valuation: A Practical Guide to Investment Banking and Private Equity, Wiley, 2013.

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
CB511PE: DATA WAREHOUSING AND DATA MINING
(Professional Elective – I)

Course Objectives

- Study data warehouse principles and its working.
- Learn data mining concepts andunderstand association rules mining.
- Discuss classification algorithms and learn how data is grouped using clustering techniques.

Course Outcomes

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

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.

Suggested Readings:

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.
4. Data Mining, Vikaram Pudi, P Radha Krishna, Oxford University Press.

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus

CB512PE: E – COMMERCE (Professional Elective – I)

Course Objectives

- Identify the major categories and trends of e-commerce applications.
- Understand the main technologies behind e-commerce systems and how these technologiesinteract.

Course Outcomes

1. Ability to identify the business relationships between the organizations and their customers
2. Ability to perform various transactions like payment, data transfer and etc.
3. Ability to identify Automation Customization
4. Ability to identify Advertising and Marketing
5. Ability to understand Consumer Search and Resource Discovery

UNIT – I

Electronic Commerce-Framework, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.
Consumer Oriented Electronic commerce - Mercantile Process models.

UNIT – II

Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.
Inter Organizational Commerce - EDI, EDI Implementation, Value added networks.

UNIT – III

Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT – IV

Corporate Digital Library - Document Library, digital Document types, corporate Data Warehouses. Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research.

UNIT – V

Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues, Information Filtering.
Multimedia - key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing's, Desktop video conferencing.

Suggested Readings:

1. Frontiers of electronic commerce – Kalakata, Whinston, Pearson.

Reference Books:

1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon,Ellizabeth Chang, John Wiley.
2. E-Commerce, S.Jaiswal – Galgotia.
3. E-Commerce, Efrain Turbon, Jae Lee, David King, H.Michael Chang.
4. Electronic Commerce – Gary P.Schneider – Thomson.
5. E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol Guyerico Traver.

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
CB513PE: DESIGN PATTERNS
(Professional Elective – I)

Pre-requisites

- A Course on Software Engineering"
- A Course on "Object Oriented Programming Through Java"

Course Objectives

- The aim of the course is to appreciate the idea behind Design Patterns in handling commonproblems faced during building an application
- This course covers all pattern types from creational to structural, behavioural to concurrencyand highlights the scenarios when one pattern must be chosen over others.

Course Outcomes

1. Understand the fundamental concepts of design patterns.
2. Understand the significance of designing a document editor
3. Use creational design patterns in software design for class instantiation
4. Ability to understand Use structural
5. Ability to understand behavioral design patterns for better class and object composition

UNIT – I

Introduction: What is a design pattern? design patterns in Smalltalk MVC, Describing Design Patterns, The Catalogue of Design Patterns, Organizing the Catalogue, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT – II

Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary

UNIT – III

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT – IV

Structural Pattern: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy

UNIT – V

Behavioural Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor.

Suggested Readings:

1. Design Patterns, Erich Gamma, Pearson Education

Reference Books:

1. Pattern's in Java, Vol –I, Mark Grand, Wiley Dream Tech.
2. Pattern's in Java, Vol-II, Mark Grand, Wiley Dream Tech.
3. Java Enterprise Design Patterns Vol-III, Mark Grand, Wiley Dream Tech.
4. Head First Design Patterns, Eric Freeman, O'reily publications.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus

MS513PE: BEHAVIORAL ECONOMICS (Professional Elective–II)

(Computer Science & Business Systems)

Course Objectives: The objectives of the course are:

1. To provide students with an introduction to the scope and application of Behavioral Economics.
2. To understand the behavior under risk and uncertainty.
3. To understand various discounting models of Behavioral Economics.
4. To Understand Social preferences and relevant models.
5. To provide an overview of positive psychology and improving decisions about health, wealth And happiness.

Course Outcomes: After completion of the course, students will be able to:

1. Understand the fundamental concepts of behavioral economics.
2. Understand the significance of decision making under risk and uncertainty.
3. Analyze the discounted utility model and other alternative inter temporal choice models.
4. Understand the Strategic interaction and its significance.
5. Analyze the importance of positive reinforcement, nudges &Happiness.

UNIT–I: INTRODUCTION

Behavioral economics – Definition and meaning, History and evolution- relation with other disciplines, objectives and scope-themes and methodology of behavioral economics (theory, evidence, consilience)–application.

UNIT–II: FOUNDATION

Values, preferences and choice- believes- heuristic and biases- state dependent preferences (such as habit formation and addiction)- mis - prediction and projection bias-anticipation and information avoidance-decision making under risk and uncertainty-prospect theory – the role of reference-dependent preference in both risky(loss aversion) and risk free(endowment)choices-mental accounting-applications.

UNIT–III: DISCOUNTING MODEL

Inter temporal choice, the discounted utility model (origin, features, methodology, anomalies with discounted utility models)-alternative inter temporal choice models (time preferences, time inconsistent preferences-hyperbolic discounting-modifying the instantaneous functions) – applications.

UNIT-IV: STRATEGIES & THEORIES

Strategic interaction, Behavioural game theory(nature, equilibrium, mixed strategies, bargaining, iterated games, signaling, learning) - application, Modelling of social preferences –nature and factors affecting social preferences distributional social preferences based on altruism, inequality a version models-reciprocity models, evidence and policy implications.

UNIT-V: **NUDGES & HAPPINESS**

Nudges & Happiness: Nudges- Definition-History & origin-Nudge Philosophy-libertarian paternalism- the choice architect- Humans & Econs- Heuristics overview- automatic vs reflective thinking systems, Nudges Policy and Happiness-the application.

TEXTBOOKS:

1. Wilkinson and Klaes, An introduction to Behavioural Economics, Palgrave McMillan.
2. Michelle Beddeley, Behavioural Economics and Finance, Rutledge, 2019.
3. J.L.Buxter, Behavioural foundations of economics McMillan Press.

REFERENCEBOOKS:

1. Alexander Rajko, Behaviour Economics and Business Ethics- Interrelation and Application, Rutledge, London, 2012.
2. Steffan Heidel, Philosophical problems of Behavioural Economics, Routlege, 1996.
3. Michael S Zoubulakis, Varieties of modern economic rationality– from Adam Smith to Contemporary Behavioural and Evolutionary Economists, Routledge,1997.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
MS514PE: ENTERPRISE RESOURCE PLANNING (Professional Elective – II)
(Computer Science & Business Systems)

Course Objectives: The objectives of the course are:

1. To provide a contemporary and forward-looking view on the theory and practice of Enterprise Resource Planning.
2. To emphasize 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 enable students understand the process of 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: After Completion of the Course, Students will be able to:

1. Demonstrate a good understanding of basic in Enterprise Systems.
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. Understand how to handle integration of ERP into organization culture.

UNIT – I: INTRODUCTION

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: ERP AND RELATED TECHNOLOGIES

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 MARKET PLACE & FUNCTIONAL MODULES

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

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

ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture.

TEXT BOOKS:

1. Alexis Leon, ERP demystified, second Edition Tata McGraw-Hill, 2015.
2. Jyotindra Zaveri, Enterprise Resource planning (ERP), Himalaya publishing house, New Delhi,2009
3. Mary Summer, “Enterprise Resource Planning”- Pearson Education 2005.

REFERENCE BOOKS:

1. Odd Joran Sagegg, ERP systems for Manufacturing Supply Chains: Applications, Configuration and Performance, Auerbach Publications, 2020.
2. Vinod Kumar Garg and Venkita Krishnan N K, “Enterprise Resource Planning Concepts and Practice”, PHI. Second Edition 2011.
3. Mahadeo Jaiswal and Ganesh Vanapalli, ERP Macmillan India,2009.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus

CB521PE: DISTRIBUTED SYSTEMS (Professional Elective – II)

Prerequisites

1. A course on "Operating Systems"
2. A course on "Computer Organization & Architecture"

Course Objectives

- This course provides an insight into Distributed systems.
- Topics include- Peer to Peer Systems, Transactions and Concurrency control, Security and Distributed shared memory

Course Outcomes

1	Ability to design distributed systems for basic level applications.
2	Ability to understand Operating System Support Processes and Threads, Communication and Invocation
3	Ability to understand Peer to Peer middleware, Routing overlays
4	Ability to understand Transactions and Concurrency control.
5	Understanding Distributed shared memory.

UNIT – I

Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models -Introduction, Architectural and Fundamental models, Networking and Internetworking, Inter process Communication, Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

UNIT - II

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture.

UNIT - III

Peer to Peer Systems–Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, Ocean Store.

Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.

Coordination and Agreement-Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT - IV

Transactions and Concurrency Control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering. Distributed Transactions- Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols,
Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

UNIT - V

Replication- Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data. Distributed shared memory, Design and Implementation issues, and Consistency models.

TEXT BOOKS:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, FourthEdition, Pearson Education.
2. Distributed Systems, S.Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.

REFERENCE BOOKS:

1. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, PearsonEducation.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani andMukesh Singhal, Cambridge, rp 2010.
3. Distributed Computing Pearls, Gadi Taubenfeld, Michel Raynal, Springer 2018

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus

CB522PE: BUSINESS INTELLIGENCE (Professional Elective – II)

Course objectives:

- Knowledge on various concepts of business intelligence, BI implementation and business analytics.

Course Outcomes:

1. Understand fundamental concepts of BI and Analytics
2. Application of BI Key Performance indicators
3. Design of Dashboards, Implementation of Web Analytics
4. Understanding Utilization of Advanced BI Tools and their Implementation.
5. Implementation of BI Techniques and BI Ethics.

UNIT - I

Business Intelligence Introduction – Definition, Leveraging Data and Knowledge for BI, BI Components, BI Dimensions, Information Hierarchy, Business Intelligence and Business Analytics. BI Life Cycle. Data for BI - Data Issues and Data Quality for BI.

UNIT - II

BI Implementation - Key Drivers, Key Performance Indicators and Performance Metrics, BI Architecture/ Framework, Best Practices, Business Decision Making, Styles of BI - vent - Driven alerts - A cyclic process of Intelligence Creation. The value of Business intelligence - Value driven and Information use.

UNIT - III

Business Analytics – Objective Curve, Web Analytics and Web Intelligence, Customer Relationship Management. Business/Corporate Performance Management - Dashboards and Scorecards, Business Activity Monitoring, Six Sigma.

UNIT - IV

Advanced BI – Big Data and BI, Social Networks, Mobile BI, emerging trends, Description of different BI-Tools (Pentaho, KNIME)

UNIT - V

Business intelligence implementation-Business Intelligence and integration implementation-connecting in BI systems- Issues of legality- Privacy and ethics- Social networking and BI.

TEXT BOOKS:

1. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and Business Intelligence Systems, 9th Edition, Pearson Education, 2009.

2. David Loshin, Business Intelligence - The Savy Manager's Guide Getting Onboard with Emerging IT, Morgan Kaufmann Publishers, 2009.

3. Rajiv Sabherwal “Business Intelligence” Wiley Publications, 2012.

REFERENCE BOOKS

1. Philo Janus, Stacia Misner, Building Integrated Business Intelligence. Solutions with SQL Server, 2008 R2 & Office 2010, TMH, 2011.

2. Business Intelligence Data Mining and Optimization for decision making, Carlo-Verellis, Wiley Publications.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus

CB523PE: CLOUD COMPUTING (Professional Elective – II)

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

Course Objectives

- This course provides an insight into cloud computing
- Topics covered include- distributed system models, different cloud service models, service- oriented architectures, cloud programming and software environments, resource management.

Course Outcomes

1. Ability to understand various service delivery models of a cloud computing architecture.
2. Ability to understand the ways in which the cloud can be programmed and deployed.
3. Able to understand Applications, on the Cloud, Managing the Cloud Approaches for Cloud Migration.
4. Understanding cloud service models.
5. Understanding 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 Labs, 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.

Suggested Readings:

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.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
CS551PC: COMPUTER NETWORKS LAB
(Common to CSE, CSBS, CSE(AI&ML), CSE (Data Science))

Course Objectives:

- To understand the working principle of various communication protocols.
- To understand the network simulator environment and visualize a network topology and observe its performance
- To analyze the traffic flow and the contents of protocol frames

Course Objectives:

- Implement data link layer farming methods
- Analyze error detection and error correction codes.
- Implement and analyze routing and congestion issues in network design.
- Implement Encoding and Decoding techniques used in presentation layer.
- To be able to work with different network tools.

List of Experiments:

1. Write a program to implement framing.
i. Fixed framing, ii. Variable framings
2. Write a program to implement stuffing techniques.
i. Bit-stuffing ii. Character stuffing
3. Write a program to implement checksum
4. Write a program to compute CRC code for the polynomial CRC-12
5. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
6. Write a program to implement classful addressing.
7. Write a program to implement classless addressing.
8. Write a program to implement Dijsktra's algorithm to compute the shortest path through a network
9. Write a program to divide a given network into n-sub networks using CISCO Packet Tracer.
10. Implement distance vector routing algorithm for obtaining routing tables at each node.
11. Write a program to implement Link state routing
12. Write a program for congestion control using Leaky bucket algorithm
13. Implement data encryption and data decryption.
14. Basic Trouble shooting commands ipconfig,ping ,tracert,nslookup,arp etc.

TEXT BOOK:

1. Computer Networks – Andrew S Tanenbaum, David.j.Wetherall, 5th Edition. Pearson Education/PHI,2011.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
CB551PC: WEB TECHNOLOGIES LAB

Course Objectives:

- To introduce Client-side scripting with JavaScript and AJAX.
- To introduce XML and processing of XML Data with Java
- To introduce PHP language for server-side scripting
- To introduce Server-side programming with Java Servlets
- To introduce Server-side programming with JSP

Course Outcomes:

1 Gain knowledge of client-side scripting, validation of forms and AJAX programming.
2 Implementing XML and how to parse and use XML Data with Java
3 Implementation of server-side scripting with PHP language
4 Implementation of Server-side programming with Java Servlets
5 Implementation of Server-side programming with JSP.

LIST OF EXPERIMENTS:

1. Develop static pages (using Only HTML) of an online book store. The pages should resemble: www.amazon.com. The website should consist the following pages.
   a. Home page
   b. Registration and user Login
   c. User Profile Page
   d. Books catalog
   e. Shopping Cart
   f. Payment By credit card
   g. Order Conformation
2. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
3. Create and save an XML document on the server, which contains 10 users information. Write a program, which takes User Id as an input and returns the user details by taking the user information from the XML document.
4. Write a PHP script to print prime numbers between 1-50.
5. PHP script to
   a. Find the length of a string.
   b. Count no of words in a string.
   c. Reverse a string.
   d. Search for a specific string.
6. Write a PHP script to merge two arrays and sort them as numbers, in descending order.
7. Write a PHP script that reads data from one file and write into another file.

8. Install TOMCAT web server. Convert the static web pages of assignments 2 into dynamic web pages using servlets and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.
9. Redo the previous task using JSP by converting the static web pages of assignments 2 into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database.

Suggested Readings:

1. WEB TECHNOLOGIES: A Computer Science Perspective, Jeffrey C. Jackson, Pearson Education.

Reference Books:

1. Deitel H.M. and Deitel P.J., "Internet and World Wide Web How to program", PearsonInternational, 2012, 4th Edition.
2. J2EE: The complete Reference by James Keogh, McGraw-Hill
3. Bai and Ekedhi, The Web Warrior Guide to Web Programming, Thomson
4. Paul Dietel and Harvey Deitel," Java How to Program", Prentice Hall of India, 8th Edition
5. Web technologies, Black Book, Dreamtech press.
6. Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
EN551HS: Advanced English Communication Skills Laboratory
(Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS))

Introduction:

The introduction of the Advanced English Communication Skills Lab is considered essential at the B.Tech 3rd year level. At this stage, the students need to prepare themselves for their career which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use appropriate English and perform the following:

1. Gatheringideasandinformationtoorganizeideasrelevantlyandcoherently.
2. Making oral presentations.
3. Writing formal letters.
4. Transferring information from non-verbal to verbal text sand vice-versa.
5. Writing project/research reports/technical reports.
6. Participating in group discussions.
7. Engaging in debates.
8. Facing interviews.
9. Taking part in social and professional communication.

Course Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

1. Improve the student's fluency in English, with a focus on vocabulary.
2. Enable them to listen to English spoken at normal conversational speed by educated English speakers.
3. Respondappropriatelyindifferentsocio-culturalandprofessionalcontexts.
4. Communicate the ir ideas relevantly and coherently in writing.
5. Prepare the students for placements.

Course Outcomes:

Students will be able to:

1. Enhance listening proficiency and reading comprehension and cultivate critical thinking ability.
2. Acquire essential vocabulary and develop strategic planning skills for effective technical writing and gain expertise in E-Correspondence and (N) etiquette.
3. Understand the nuances of oral skills (Speaking skills), gain competence in delivering effective presentations, employing suitable language and body language.
4. Communicate confidently in group discussions and enhance the employability skillsof students.
5. Apply effective techniques and strategies for successful job interviews.

Syllabus:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Listening and Reading Comprehension:** Active Listening – Development of Listening SkillsThroughAudioclips-BenefitsofReading–MethodsandTechniquesofReading– BasicStepsto EffectiveReading–CommonObstacles–DiscourseMarkersorLinkers-Sub-skillsofreading-Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning - Critical Reading — Reading Comprehension – Exercises for Practice.
2. **Activities on Writing Skills**: Vocabulary for Competitive Examinations - Planning for Writing – Improving Writing Skills –Structure and presentation of different types of writing –Free Writing and Structured Writing - Letter Writing –Writing a Letter of Application – Resume vs.Curriculum Vitae – Writing a Résumé**–** Styles of Résumé- e-Correspondence – Emails –Blog Writing - (N)etiquette – Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing– Exercises for Practice.
3. **Activities on Presentation Skills–**Dealing with Glossophobia or stage fear, starting a conversation–responding appropriately and relevantly– using the right language and body language – Role Play in different situations including Seeking Clarification,MakingaRequest,AskingforandRefusingPermission,ParticipatinginaSmallTalk– Oral presentations (individual and group) through JAM sessions- PPTs – Importance of Presentation Skills – Planning, Preparing, Rehearsing and Making a Presentation - Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation.
4. **Activities on Group Discussion (GD):** Types of GD and GD as apart of a Selection Procedure-Dynamics of Group Discussion-myths and facts (Dos and Don'ts)ofGD-Intervention,Summarizing-ModulationofVoice,BodyLanguage, Relevance, Fluency and Organization of Ideas -GD Strategies – Exercises for Practice.
5. **Activities on Interview Skills**: Concept and Process - Interview Preparation Techniques - Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies - Interview Through Tele-conference & Video-conference -Mock Interviews.

Suggested Books:

1. Effective Technical Communication by M Ashraf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition.
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

Reference Books:

1. Rizvi, M. Ashraf (2018). *Effective Technical Communication*.(2nded). Mc Graw Hill Education (India) Pvt. Ltd.
2. Suresh Kumar E.(2015).*Engineering English.* Orient Black Swan Pvt. Ltd.
3. Bailey, Stephen.(2018). Academic *Writing: A Handbookf or International Students.*(5thEdition). Routledge.
4. Koneru, Aruna.(2016). *Professional Communication*. Mc Graw Hill Education (India) Pvt. Ltd.

5. Raman, Meenakshi & Sharma, Sangeeta. (2015). *Technical Communication, 3E: Principles and Practice.* Oxford University Press.
6. Anderson, Paul V.(2007). *Technical Communication***.** Cengage Learning Pvt. Ltd. New Delhi.
7. McCarthy, Michael; O'Dell, Felicity & Redman, Stuart.(2017) .*English Vocabulary in Use* Series. Cambridge University Press.
8. Sen, Leela. (2009). *Communication Skills.* PHI Learning Pvt Ltd. New Delhi.
9. Elbow, Peter.(1998).*Writing with Power.* Oxford University Press.
10. Goleman,Daniel.(2013).*Emotional Intelligence*: *Why it can matter more than IQ.* Blooms bury Publishing.
11. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
12. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
13. How to Write and Speak Better, Reader's Digest, 2003.
14. TOEFL Reading & Writing Workout, The Princeton Review.
15. How to prepare for Group Discussions and Interviews by Harimohan Prasad and Rajneesh Prasad, Tata Mcgraw Hill.
16. Keep Talking, Frederick Klippel, Cambridge University Press, South Asian edition (6 May 2010).
17. Objective English, Edgar Thorpe &Showick Thorpe, Pearson; 5th edition (1 August 2013).
18. Communication Skills for Engineers, Sunitha Mishra, C.Murali Krishna, Pearson; 4th Edition.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
CS553PC: UI DESIGN – FLUTTER
(Common to CSE, IT, CSBS, CSE(AI&ML))

Course Objectives:

- Learns to Implement Flutter Widgets and Layouts
- Understands Responsive UI Design and with Navigation in Flutter
- Knowledge on Widgets and customize widgets for specific UI elements, Themes
- Understand to include animation apart from fetching data

Course Outcomes:

- Implements Flutter Widgets and Layouts
- Responsive UI Design and with Navigation in Flutter
- Create custom widgets for specific UI elements and also Apply styling using themes and custom styles.
- Design a form with various input fields, along with validation and error handling
- Fetches data and write code for unit Test for UI components and also animation

List of Experiments:

Students need to implement the following experiments

1. a) Install Flutter and Dart SDK.
   b) Write a simple Dart program to understand the language basics.

2. a) Explore various Flutter widgets (Text, Image, Container, etc.).
   b) Implement different layout structures using Row, Column, and Stack widgets.
3. a) Design a responsive UI that adapts to different screen sizes.
   b) Implement media queries and breakpoints for responsiveness.

4. a) Set up navigation between different screens using Navigator.
   b) Implement navigation with named routes.

5. a) Learn about statefull and stateless widgets.
   b) Implement state management using set State and Provider.

6. a) Create custom widgets for specific UI elements.
   b) Apply styling using themes and custom styles.

7. a) Design a form with various input fields.
   b) Implement form validation and error handling.

8. a) Add animations to UI elements using Flutter's animation framework.
   b) Experiment with different types of animations (fade, slide, etc.).

9. a) Fetch data from a REST API.
   b) Display the fetched data in a meaningful way in the UI.

10. a) Write unit tests for UI components.
    b) Use Flutter's debugging tools to identify and fix issues.

TEXT BOOK:

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
MC501HS: INTELLECTUAL PROPERTY RIGHTS
(Common to EEE, CSE, IT, CSBS, CSE (AI&ML) & CSE (DS))

Course Objectives: The objectives of the course are:

1. To enable the students to have an overview of Intellectual Property Rights.
2. To provide comprehensive knowledge to the students regarding Trademarks Registration process and law related to it.
3. To disseminate knowledge on Copyrights, its related rights and recent developments.
4. To make the students understand Patent Regime in India and abroad.
5. To understand the framework of Trade secrets.

Course Outcomes: By the end of the course students shall:

1. Gain knowledge on Intellectual property rights and their importance.
2. Understand Indian and International Trademark Law and procedure for registration of Trademarks.
3. Acquire knowledge on Copyright Law, and the privileges awarded to the copyright owners.
4. Familiarized with the process of acquiring the patent and relevant laws.
5. Learn the importance of trade secrets for business sustainability.

UNIT – I: INTRODUCTION TO INTELLECTUAL PROPERTY

Introduction of IPR-Meaning of intellectual property, types of intellectual property-trademarks, copyrights, patents, trade secrets, importance of intellectual property rights, International organizations-WTO-WIPO-USPTO-INTA, International Conventions, agencies and treaties- Paris Convention-Berne Convention- Madrid Protocol-NAFTA-PCT-GATT-TRIPS.

UNIT – II: TRADEMARKS

Trademarks: Purpose and functions of Trademarks-Categories of marks, acquisition of trademark rights - Protectable matter - Selecting and evaluating Trademark- Trademark registration process – Trademark Infringement - Remedies for infringement of Trademarks-New developments in Trademark Law- International Trademarks Law.

UNIT III: COPYRIGHT

Copyrights-Fundamentals of Copyright Law -Requirements of Copyrightability- Originality of material, fixation of material, Authorship works, exclusions from copyright protection- Rights of Copyright Owner-Right of reproduction of copyrighted work, right to do derivative works ,right to distribute copies of the copyrighted work, right to perform the work publicly, right to display the copyrighted work, – Copyright Ownership issues – Joint Works, Works made for Hire, Specially commissioned works, Copyright Registration - Notice of Copyright – Copyright Infringement - Remedies for infringement in Copyrights- New developments in Copyright Law- International Copyright Law.

UNIT IV: PATENTS

Concept of Patent - Classification – Utility Patents – Design Patents and Plant Patents, Patent searching process-Types of Patent Applications-Patent Registration Process, Ownership, Transfer, Assignment and Licensing of Patent-Patent Infringement, Remedies for Infringement of Patents, New developments in Patent Law- International Patent Law.

UNIT – V: TRADE SECRETS & LAW OF UNFAIR COMPETITION

Trade Secrets: Trade secret law, determination of trade secret status, measures for protecting trade secret -Liability for misappropriation of trade secrets, protection for submissions, trade secret litigation. New developments in Trade secrets Law- International Trade Secret law.

Law of Unfair Competition: Passing off, Misappropriation, Right of publicity, Dilution of trademarks, Product disparagement, False advertising, Internet Piracy.

TEXT BOOKS:

1. Deborah. E.Bouchoux, Intellectual property, Cengage learning India Pvt.Ltd, 4th edition, 2013.
2. Prabuddha Ganguli, Intellectual Property Right, Tata McGraw Hill Publishing Company,8th edition,2016.

REFERENCES:

1. Richard Stim, Intellectual Property, Cengage learning India Pvt.Ltd. 3rdedition, 2017.
2. Vinod.V. Sope, Managing Intellectual Property, Asoka K.Ghosh, 2ndedition,2010.

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B.Tech. in COMPUTER SCIENCE & BUSINES SYSTEMS
V Semester Syllabus

MC501ES: CYBER SECURITY

(Common to CSE, IT, CSBS)

Course objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

Course Outcomes:

- The students will be able to understand cyber-attacks, types of cybercrimes, cyber laws and how to protect them self and ultimately the entire Internet community from such attacks.

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defence, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- IV

Cyber Security: Organizational Implications: Introduction cost of cybercrimes and IPR issues, web Threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Cybercrime: Examples and Mini-Cases Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCES:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
IT601PC: AUTOMATA THEORY AND COMPILER DESIGN
(*Common to IT, CSBS & CSE (Data Science*))

Course Objectives:

1. To introduce the fundamental concepts of formal languages, grammars and automata theory.
2. To understand deterministic and non-deterministic machines and the differences betweendecidability and undecidability.
3. Introduce the major concepts of language translation and compiler design and impart theknowledge of practical skills necessary for constructing a compiler.
4. Topics include phases of compiler, parsing, syntax directed translation, type checking use ofsymbol tables, intermediate code generation.

Course Outcomes:

1. Able to employ finite state machines for modeling and solving computing problems.
2. Able to design context free grammars for formal languages.
3. Able to distinguish between decidability and undecidability.
4. Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
5. Acquire skills in using lex tool and design LR parsers

UNIT – I :

Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

Nondeterministic Finite Automata: Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

Deterministic Finite Automata: Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA

UNIT – II :

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

Pumping Lemma for Regular Languages: Statement of the pumping lemma, Applications of the Pumping Lemma.

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

UNIT – III :

Push Down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state

Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines

UNIT – IV :

Introduction: The structure of a compiler

Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator Lex

Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom- Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers

UNIT – V :

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax- Directed Translation Schemes, Implementing L-Attributed SDD's.

Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code

Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management

Suggested Readings :

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science–Automata languages and computation, Mishra and Chandrashekaran, 2nd Edition, PHI.

Reference Books :

1. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi,Jeffry D. Ullman, 2nd Edition, P earson.
2. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan,Rama R, Pearson.
3. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
4. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
5. Compiler Construction, Kenneth C. Louden, Thomson. Course Technology.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
IT602PC: ALGORITHM DESIGN AND ANALYSIS
(*Common to IT & CSBS*)

Prerequisites :

- Programming for problem solving and Data Structures

Course Objectives:

1. Introduces the notations for analysis of the performance of algorithms.
2. Introduces the data structure disjoint sets.
3. Describes major algorithmic techniques (divide and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
4. Describes how to evaluate and compare different algorithms using worst-, average and best case analysis.

Course Outcomes:

1. Analyze the performance of algorithms and apply the general method for various sorting algorithms
2. Illustrate Greedy method with various applications
3. Understand and apply the concept of dynamic programming for various applications.
4. Choose appropriate backtracking strategy for a specified application
5. Demonstrate Branch and Bound strategy for various applications

UNIT – I : Introduction:

Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.

Divide and conquer : General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

UNIT – II :

Disjoint Sets: Disjoint set operations, union and find algorithms

Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimumcost spanning trees, Single source shortest path problem.

UNIT – III: Dynamic Programming:

General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

UNIT – IV: Backtracking:

General method, applications, n-queen's problem, sum of subsets problem, graph coloring; Hamiltonian path problem

UNIT –V: Branch and Bound:

General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution. NP-Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

Suggested Readings

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan, University Press.

Reference Books:

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
MS601HS: MARKETING MANAGEMENT AND RESEARCH
(**Computer Science & Business Systems**)

Course Objectives: The objectives of the course are:

1. To understand the basic concepts of market management.
2. To create an awareness of various marketing opportunities and develop marketing mix elements.
3. To gain knowledge on developing customer-driven segmentation, targeting, and positioning strategies.
4. To develop an understanding of the basic framework of the marketing research process and research design.
5. To understand scaling, data analysis, interpretation, and report writing techniques.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand the scope of marketing and philosophies and environment.
2. Analyze various marketing opportunities and product development.
3. Analyze markets and design customer-driven segmentation, targeting, and positioning strategies.
4. Gain knowledge of the marketing research process and research design.
5. Acquire knowledge of scaling, data analysis, interpretation, and report writing techniques.

UNIT – I: INTRODUCTION TO MARKETING

Importance and scope of Marketing, Core Marketing Concepts, Marketing Philosophies, Marketing Environment, Marketing Strategies & Plans, Changing Marketing landscape.

UNIT – II: ANALYSING MARKETING OPPORTUNITIES, CUSTOMER VALUE AND MARKETING MIX

Consumer Decision Making, Building Customer Value, Analysing Consumer Markets – Consumer Behaviour – Cultural, Social & Personal Factors, developing products & brands – product levels; classifying products, product range, product line & product mix, Product Life Cycles, new product development., New Service Development, Stages of Product/ Service innovation development, The process of adoption, Branding.

UNIT – III: DESIGNING A CUSTOMER DRIVEN STRATEGY – STP PROCESS

Market segmentation - STP Process - segmentation ofconsumer market, business market, requirement for effective segmentation, market targeting evaluating market segmentation, selecting target market segmentation, positioning – Positioning andrepositioning positioning maps, product positioning strategies.

UNIT – IV: INTRODUCTION TO MARKETING RESEARCH

Introduction, Management uses of marketing research, ProblemFormulation &steps in decision Making Process, Research Design, Exploratory, Descriptive, Causal Research Design, Sampling Design Process, Classification of Sampling Techniques, Probability and Non- Probability Sampling Techniques.

UNIT - V: MEASUREMENT AND SCALING

Difficulty of measurement, sources of error, Nominal, Ordinal, Interval and Ratio scales, Validity, and reliability. Analysis and Interpretation of Data: Report Writing, Report Preparation and Presentation. Plagiarism- Communicating the Research results.

TEXT BOOKS:

1. Philip Kotler, Gray Armstrong, Prafulla Agnihotri, Principles of Marketing, 17th edition, Pearson Education, 2022.
2. Naresh K Malhotra and Satyabhusan Dash, Marketing Research – An Applied Orientation, 17th edition, Pearson Education India, 2019.
3. Lamb, Hair, Sharma, McDaniel, Principles of Marketing, A South Asian Perspective Cengage Learning, 2016.

REFERENCE BOOKS:

1. Paul Baines, Chris Fill, Kelly Page, Piyush Sinha, Marketing, Asian Edition, Oxford University Press, 2015.
2. Arun Kumar & N. Meenakshi, Marketing Management, Vikas, 2016.
3. Rajan Saxena, Marketing Management, 6th edition, Tata McGraw Hill, 2019.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CS632PE: INTERNET OF THINGS (Professional Elective – III)
(Common to CSE, CSBS)

Pre-Requisites: Computer organization, Computer Networks

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

Course Outcomes:

- Interpret the impact and challenges posed by IoT networks leading to new architectural Models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Identify the applications of IoT in Industry.

UNIT - I

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels and Deployment Templates Domain Specific IoTs – Home automation, Environment, Agriculture, Health and Lifestyle

UNIT - II

IoT and M2M – M2M, Difference between IoT and M2M, SDN and NFV for IoT, IoT System Management with NETCOZF, YANG- Need for IoT system Management, Simple Network management protocol, Network operator requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG

UNIT - III

IoT Systems – Logical design using Python-Introduction to Python – Python Data types & Data structures, Control flow, Functions, Modules, Packaging, File handling, Data/Time operations, Classes, Exception, Python packages of Interest for IoT

UNIT - IV

IoT Physical Devices and Endpoints - Raspberry Pi, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry PI with Python, Other IoT devices. IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs, WAMP-AutoBahn for IoT, Xively Cloud for IoT, Python web application framework –Django, Designing a RESTful web API

UNIT V

Case studies- Home Automation, Environment-weather monitoring-weather reporting- air pollution monitoring, Agriculture.

TEXT BOOK:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547.

REFERENCE BOOK:

1. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, **ISBN: 9789350239759**

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus

CB631PE: R PROGRAMMING (Professional Elective – III)

Course Objectives

- Understanding and being able to use basic programming concepts
- Automate data analysis
- Working collaboratively and openly on code
- Knowing how to generate dynamic documents
- Being able to use a continuous test-driven development approach

Course Outcomes

1. Understand to use and program in the programming language R
2. Understand R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes, Vectors
3. Implement Creating Lists, General List Operations, List Indexing Adding and Deleting List, Elements
4. Understand Factors and Tables: Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables
5. Implement Creating Graphs, Customizing Graphs using R.

UNIT – I

Introduction: Overview of R, R data types and objects, reading and writing data, sub setting, R Objects, Essentials of the R Language, Installing R, Running R, Packages in R, Calculations, Complex numbers in R, Rounding, Arithmetic, Modulo and integer quotients, Variable names and assignment, Operators, Integers, Factors, Logical operations.

UNIT – II

Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes, Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations.

UNIT – III

Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List, Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List, Components and Values Applying Functions to Lists, DATA FRAMES, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations.

UNIT – IV

Factors and Tables: Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables, Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions.

UNIT – V

Graphics: Creating Graphs, Customizing Graphs, Saving Graphs to Files, Customizing Graphs, Creating Three-Dimensional Plots.

Suggested Readings:

1. R Programming for Data Science by Roger D. Peng
2. The Art of R Programming by Norman Matloff Cengage Learning India.

Reference Books:

1. Hadley Wickham, Garrett Grolemund, R for Data Science: Import, Tidy, Transform, Visualize,and Model Data 1st Edition, O'Reilly.
2. Tilman M. Davies, The book of R a first course in programming and statistics, no starch press.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CB632PE: MACHINE LEARNING (Professional Elective-III)
(CSBS)

Course Objectives

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.

Course Outcomes

1. Understand the concepts of computational intelligence like machine learning
2. Understand the Neural Networks and its usage in machine learning application.
3. Understand the Bayes theorem and concept learning,
4. Able to Understand the Genetic algorithms learning rule sets Reinforcement Learning
5. Ability to Understand Introduction, learning with perfect domain theories

UNIT – I

Introduction: Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning.

Concept learning and the general to specific ordering – Introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias.

Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

UNIT – II

Artificial Neural Networks-1 : Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

UNIT – III

Bayesian learning : Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibs algorithm

Instance-Based Learning- Introduction, *k*-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT – IV

Genetic Algorithms : Motivation, Genetic algorithms, an illustrative example, hypothesis Space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms

Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting re solution.

Reinforcement Learning–Introduction, the learning task, *Q*–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT – V

Analytical Learning-1 : Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.

Analytical Learning-2-Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.

Combining Inductive and Analytical Learning–Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis.

Suggested Readings:

1. Tom M. Mitchell, “Machine Learning”, MGH

Reference Books:

1. Stephen Marshland, “Machine Learning: An Algorithmic Perspective”, Taylor & Francis.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CB633PE: DEVOPS (Professional Elective – III)

Course Objectives

- Describe the agile relationship between development and IT operations.
- Understand the skill sets and high-functioning teams involved in DevOps and related methodsto reach a continuous delivery capability
- Implement automated system update and DevOps lifecycle

Course Outcomes

1. Identify components of Devops environment
2. Describe Software development models and architectures of DevOps
3. Apply different project management, integration, testing and code deployment tool
4. Investigate different DevOps Software development models
5. Assess various Devops practices, Collaborate 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

Suggested Readings:

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 Books:

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. AddisonWesley; ISBN.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CB634PE: ADVANCED DATA STRUCTURES (Professional Elective – III)

Prerequisites: A course on "Data Structures".

Course Objectives

- Introduces the heap data structures such as leftist trees, binomial heaps, Fibonacci and min-max heaps
- Introduces a variety of data structures such as disjoint sets, hash tables, search structures anddigital search structures

Course Outcomes

1. Ability to understand how the choice of data structures impact the performance of programs
2. Design programs using a variety of data structures, including hash tables, search structures and digital search structures.
3. Ability to understand the Search Structures Multiway Search Trees
4. Ability to understand Digital Search Structures
5. Ability to understand Pattern Matching Algorithms

UNIT – I

Heap Structures: Introduction, Min-Max Heaps, Leftist trees, Binomial Heaps, Fibonacci heaps.

UNIT – II

Hashing and Collisions: Introduction, Hash Tables, Hash Functions, different Hash Functions: Division Method, Multiplication Method, Mid-Square Method, Folding Method, Collisions

UNIT – III

Search Structures: OBST, AVL trees, Red-Black trees, Splay trees,

Multiway Search Trees: B-trees., 2-3 trees

UNIT – IV

Digital Search Structures: Digital Search trees, Binary tries and Patricia, Multiway Tries, Suffix trees, Standard Tries, Compressed Tries

UNIT – V

Pattern Matching: Introduction, Brute force, the Boyer –Moore algorithm, Knuth-Morris-Pratt algorithm, Naïve String, Harspool, Rabin Karp

Suggested Readings:

1. Fundamentals of data structures in C++ Sahni, Horowitz, Mehatha, Universities Press.
2. Introduction to Algorithms, TH Cormen, PHI.

Reference Books:

1. Design methods and analysis of Algorithms, SK Basu, PHI.
2. Data Structures & Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education.
3. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Universities Press.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
MC601ES: ARTIFICIAL INTELLIGENCE
(Common to IT, CSBS)

Course Objectives:

- To train the students to understand different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation, reasoning.
- Study of Markov Models enable the student ready to step into applied AI.

UNIT – I

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents

Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

UNIT - II

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning

Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

UNIT - III

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Non-monotonic Reasoning, Other Knowledge Representation Schemes

Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

UNIT - IV

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

UNIT - V

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

TEXT BOOK:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hillpublications, Third Edition, 2009.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CB651PC: ALGORITHMS AND COMPILER DESIGN LAB

Prerequisites

- A Course on "Data Structures"
- A course on "Formal Languages and Automata Theory"
- A Course on "Objected Oriented Programming through Java"

Course Objectives

- To understand the algorithms design techniques
- To provide practical programming skills necessary for constructing a compiler

Course Outcomes

1. Develop feasible and optimal solutions by using Greedy and dynamic programming.
2. Able to design the searching algorithms and design a compiler given a set of language features.
3. Ability to use the knowledge of patterns, tokens & regular expressions for lexical analysis.
4. Able to use lex tool & yacc tool to develop a scanner & parser.
5. Design and implement LL(1), SLR, LR(1), LALR and operator precedence parsers

LIST OF EXPERIMENTS (Algorithms):

1. Write a program to implement Greedy Knapsack problem.
2. Write a program to implement Prim's minimum cost spanning tree by using Greedy Method
3. Write a program to implement Kruskal's minimum cost spanning tree by using Greedy Method
4. Write a program to implement Optimal Binary Search Tree
5. Write a program to implement 0/1 Knapsack problem by using Dynamic Programming
6. Write a program to implement n-Queen's problem

LIST OF EXPERIMENTS (Compiler Design)

1. Design a DFA to accept all strings containing a substring (01)
2. Write a LEX Program to scan reserved word & Identifiers of C Language
3. Implement Predictive Parsing algorithm
4. Implement RD Parser for the Grammar

   S->AB
   A-> a/E
   B-> b/E
5. Implement SLR(1) Parsing algorithm
6. Write a YACC program to parse the String

Suggested Readings:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan, University Press.
2. Compilers: Principles, Techniques and Tools: Alfred V.Aho, Ravi Sethi, Jeffrey D. Ullman;Pearson Education

Reference Books:

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons
4. Java The Complete Reference, Herbert Schildt's, 9th Edition, TATA McGraw – HILL.
5. Modern Compiler Implementation in C- Andrew N. Appel, Cambridge University Press.
6. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
7. Modern Compiler Design- Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Wiley Dreamtech.
8. Engineering a Compiler-Cooper & Linda, Elsevier.
9. Compiler Construction, Louden, Thomson.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CB611PE: INTERNET OF THINGS LAB
(Professional Elective-III)

Course Objectives:

- To introduce the raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of distance sensor on IoT devices

Course Outcomes:

1. Ability to introduce the concept of M2M (machine to machine) with necessary protocols and get awareness in implementation of distance sensor
2. Get the skill to program using python scripting language which is used in many IoT devices
3. Ability to introduce and implementation Node MCU
4. Ability to introduce and implementation of DHT Sensor

List of Experiments :

1. Using raspberry pi
    a. Calculate the distance using a distance sensor.
    b. Basic LED functionality.

2. Using Arduino
    a. Calculate the distance using a distance sensor.
    b. Basic LED functionality.
    c. Calculate temperature using a temperature sensor.

3. Using Node MCU
    a. Calculate the distance using a distance sensor.
    b. Basic LED functionality.
    c. Calculate temperature using a temperature sensor.

4. Installing OS on Raspberry Pi
    a) Installation using PiImager
    b) Installation using image file
        - Downloading an Image
        - Writing the image to an SD card
            - using Linux
            - using Windows
        - Booting up Follow the instructions given in the URL https://www.raspberrypi.com/documentation/computers/getting-started.html

5. Accessing GPIO pins using Python
    a) Installing GPIO Zero library.

    First, update your repositories list:

    sudo apt update

    Then install the package for Python 3:

    sudo apt install python3-gpiozero

    b) Blinking an LED connected to one of the GPIO pin
    c) Adjusting the brightness of an LED Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) using the in-built PWM wavelength.
6. Collecting Sensor Data
    a) DHT Sensor interface
    - Connect the terminals of DHT GPIO pins of Raspberry Pi.
    - Import the DHT library using import Adafruit_DHT
    - Read sensor data and display it on screen.

Suggested Readings:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

Reference Books:

1. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3- 642-19156-5 e-ISBN 978-3-642-19157-2, Springer, 2016
2. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CB612PE: R PROGRAMMING LAB (Professional Elective-III)

Course Objectives

- Understanding and being able to use basic programming concepts
- Utilize and R Data types for developing programs.
- Make use of different R Data Structures.
- Develop programming logic using R Packages.

Course Outcomes:

At the end of the Course, the Student will be able to:

1. Show the installation of R Programming Environment.
2. Implement R Data types for developing programs.
3. Make use of different R Data Structures.
4. Develop programming logic using R Packages.
5. Analyze the datasets using R programming capabilities.

List of Experiments:

1. R Environment setup: Installation of R and RStudio in Windows
2. Write R commands for
   i. Variable declaration and retrieving the value of the stored variables,
   ii. Write an R script with comments,
   iii. Type of a variable using class () Function.
3. Write R command to
   i. illustrate summation, subtraction, multiplication, and division operations on vectors using vectors.
   ii. Enumerate multiplication and division operations between matrices and vectors in R console
4. Write R command to
   i. Illustrate the usage of Vector sub setting& Matrix sub setting
   ii. Write a program to create an array of 3×3 matrixes with 3 rows and 3 columns.
   iii. Write a program to create a class, object, and function
5. Write a command in R console
   i. to create a tshirt_factor, which is ordered with levels ‘S’, ‘M’, and ‘L’. Is it possible to identify from the examples discussed earlier, if blood type ‘O’ is greater or less than blood type ‘A’?
   ii. Write the command in R console to create a new data frame containing the ‘age’ parameter from the existing data frame. Check if the result is a data frame or not. Also R commands for data frame functions cbind(), rbind(), sort()

6. Write R command for

i. Create a list containing strings, numbers, vectors and logical values

ii. To create a list containing a vector, a matrix, and a list. Also give names to the elements in the list and display the list also access the list elements

iii. To add a new element at the end of the list and delete the element from the middle display the same

iv. To create two lists, merge two lists. Convert the lists into vectors and perform addition on the two vectors. Display the resultant vector.

7. Write R command for

i. logical operators—AND (&), OR (|) and NOT (!).

ii. Conditional Statements

iii. Create four vectors namely patientid, age, diabetes, and status. Put these four vectors into a data frame patientdata and print the values using a for loop& While loop

iv. Create a user-defined function to compute the square of an integer in R

v. Create a user-defined function to compute the square of an integer in R

vi. Recursion function for a) factorial of a number b) find nth Fibonacci number

8. Write R code for

i) Illustrate Quick Sort

ii) Illustrate Binary Search Tree

9. Write R command to

i. illustrate Mathematical functions & I/O functions ii. Illustrate Naming of functions and sapply(), lapply(), tapply() &mapply()

10. Write R command for

i. Pie chart& 3D Pie Chart, Bar Chart to demonstrate the percentage conveyance of various ways for traveling to office such as walking, car, bus, cycle, and train

ii. Using a chart legend, show the percentage conveyance of various ways for traveling to office such as walking, car, bus, cycle, and train.

a. Walking is assigned red color, car – blue color, bus – yellow color, cycle – green color, and train – white color; all these values are assigned through cols and lbls variables and the legend function.

b. The fill parameter is used to assign colors to the legend.

c. Legend is added to the top-right side of the chart, by assigning

iii. Using box plots, Histogram, Line Graph, Multiple line graphs and scatter plot to demonstrate the relation between the cars speed and the distance taken to stop, Consider the parameters data and x Display the speed and dist parameter of Cars data set using x and data parameters

TEXT BOOK:

1. K G Srinivas, G M Siddesh, “Statistical programming in R”, Oxford Publications.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CB613PE: MACHINE LEARNING LAB (Professional Elective-III)

Course Objectives

- To introduce students to the basic concepts and techniques of Machine Learning
- To improve their skills using Python Programming Libraries like sci-learn and Numpy
- To demonstrate various machine learning techniques
- To demonstrate various machine learning techniques
- To develop skills of using recent machine learning software for solving practical problems

Course Outcomes

1. Compare Machine Learning algorithms based on their advantages and limitations and use the best one according to situation
2. Interpret and understand modern notions in data analysis-oriented computing
3. Apply Conditional Probability using Bayes Theorem
4. Evaluate Decision tree algorithms using real world data
5. Experiment with real-world data using Machine Learning algorithms

LIST OF EXPERIMENTS (Algorithms):

1. Implement the Find-S algorithm for finding the most specific hypothesis based on a given set of training data samples(use enjoy sports .CSV file)
2. Implement the decision tree based ID3 algorithm.
3. Implement single layer perceptron.
4. Implement multilayer perceptron with back propagation.
5. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%)
6. Implement linear regression using python
7. Implement Naïve Bayes theorem to classify the English text
8. Implement k-nearest neighbors classification using python
9. Given the following data, which specify classifications for nine combinations of

VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k- means clustering with 3 means (i.e., 3 centroids)

VAR 1	VAR2	CLAS S
1.713	1.586	0
0.180	1.786	1
0.353	1.240	1
0.940	1.566	0
1.486	0.759	1
1.266	1.106	0
1.540	0.419	1
0.459	1.799	1
0.773	0.186	1

10. Implement an algorithm to demonstrate the significance of genetic algorithm

Suggested Readings:

1. Tom M. Mitchell, “Machine Learning”, MGH

Reference Books:

1. Stephen Marshland, “Machine Learning: An Algorithmic Perspective”, Taylor & Francis.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CB614PE: DEVOPS LAB (Professional Elective-III)

Course Objectives:

- Describe the agile relationship between development and IT operations.
- Understand the skill sets and high-functioning teams involved in
- DevOps and related methods to reach a continuous delivery capability
- Implement automated system update and DevOps lifecycle

Course Outcomes:

1. Identify components of Devops environment
2. Apply different project management, integration, testing and code deployment tool
3. Investigate different DevOps Software development, models
4. Demonstrate continuous integration and development using Jenkins.

List of Experiments:

1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code written in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.
8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application developed in exercise 7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in JavaScript and perform testing using Selenium.
12. Develop test cases for the above containerized application using selenium.

TEXT BOOKS:

1. Joakim Verona. Practical Dev ops, 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 BOOKS / LEARNING RESOURCES:

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley
2. EdurekaDevOps Full Course - https://youtu.be/S_0q75eD8Yc

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CB615PE: ADVANCED DATA STRUCTURES LAB (PE – III Lab)

Prerequisites: A course on Computer Programming & Data Structures

Course Objectives

- Introduces the basic concepts of Abstract Data Types.
- Reviews basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs, and B-trees.
- Introduces sorting and pattern matching algorithms.

Course Outcomes

1. Ability to select the data structures that efficiently model the information in a problem.
2. Ability to assess efficiency trade-offs among different data structure implementations or combinations.
3. Implement and know the application of algorithms for sorting and pattern matching.
4. Design programs using a variety of data structures, including hash tables, binary and generaltree structures, search trees, tries, heaps, graphs, and B-trees.

LIST OF EXPERIMENTS:

1. Write a program to perform the following operations:
   a) Insert an element into a binary search tree.
   b) Delete an element from a binary search tree.
   c) Search for a key element in a binary search tree.

2. Write a program for implementing the following sorting methods:
   a) Merge sort b) Heap sort c) Quick sort

3. Write a program to perform the following operations:
   a) Insert an element into a B- tree.
   b) Delete an element from a B- tree.
   c) Search for a key element in a B- tree.

4. Write a program to perform the following operations:
   a) Insert an element into a Min-Max heap
   b) Delete an element from a Min-Max heap
   c) Search for a key element in a Min-Max heap

5. Write a program to perform the following operations:
   a) Insert an element into a Lefiist tree
   b) Delete an element from a Leftist tree
   c)Search for a key element in a Leftist tree

6. Write a program to perform the following operations:
   a) Insert an element into a binomial heap
   b) Delete an element from a binomial heap.
   c) Search for a key element in a binomial heap

7. Write a program to perform the following operations:
   a) Insert an element into a AVL tree.
   b) Delete an element from a AVL search tree.
   c) Search for a key element in a AVL search tree.

8. Write a program to perform the following operations:
   a) Insert an element into a Red-Black tree.
   b) Delete an element from a Red-Black tree.
   c) Search for a key element in a Red-Black tree.

9. Write a program to implement all the functions of a dictionary using hashing.
10. Write a program for implementing Knuth-Morris-Pratt pattern matching algorithm.
11. Write a program for implementing Brute Force pattern matching algorithm.
12. Write a program for implementing Boyer pattern matching algorithm.

Suggested Readings:

1. Fundamentals of Data structures in C, E. Horowitz, S. Sahni and Susan Anderson Freed, 2ndEdition, Universities Press.
2. Data Structures Using C – A.S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearsoneducation.
3. Introduction to Data Structures in C, Ashok Kamthane, 1st Edition, Pearson.

Reference Books:

1. The C Programming Language, B.W. Kernighan, Dennis M. Ritchie, PHI/Pearson Education.
2. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press.
3. Data structures: A Pseudocode Approach with C, R.F. Gilberg And B.A. Forouzan 2nd Edition,Cengage Learning.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
MC601BS: ENVIRONMENTAL SCIENCE(For Lateral Entry Students)
(Common to all branches)

Course Objectives

- To understand the natural resources and their conservation.
- To understand the importance of ecosystem, biodiversity and ecological balance for sustainable development.
- To gain knowledge about environmental pollution, effects and controlling measures.
- To study about global environmental problems and global issues.
- To understand the environmental policies, regulations and sustainable development.

Course Outcomes:

After completing the course, the student will be able to:

- Learn about different types of natural resources and take up the measures to protect the resources.
- Get the information about ecosystem, biodiversity and their usage and conservation.
- Get the information about the types of pollution, understand their effects and controlling measures.
- Gain the knowledge about current global environmental issues and initiations to be taken to protect the environment.
- Gain the knowledge about environmental acts, EIA, sustainable development and follow the rules and regulations.

UNIT - I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity.

UNIT – II Natural Resources:

Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefitsand problems.

Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources,

Land resources: Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT - III

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In- Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution,

Air Pollution: Primary and secondary pollutants, causes and effects, Ambient air quality standards.

Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil.

Solid waste: Municipal Solid Waste management composition and characteristics of e-Waste and its management.

Pollution control technologies: Wastewater Treatment methods: Primary, secondary and Tertiary.

Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act-1981, Water Act, biomedical waste management and handling rules, hazardous waste management and handling rules.

Environmental Impact of Assessment (EIA): structure, methods of baseline data acquisition. Concepts of Environmental Management Plan (EMP).

Towards Sustainable Future: Concept of Sustainable Development Goals, Population and its explosion, Environmental Education, Human health, Environmental Ethics, Concept of Green Building, Green chemistry principles, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha forUniversity Grants Commission.
2 Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHLLearning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHILearning Pvt. Ltd.
3. Environmental Studies by R. Rajagopalan, Oxford University Press.
4. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BSPublications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus

IT611OE: JAVA PROGRAMMING
(Open Elective – I)

Course Objectives:

1. To introduce object-oriented programming principles and apply them in solving problems.
2. To introduce the implementation of packages and interfaces.
3. To introduce the concepts of exception handling and multi threading.
4. To introduce the design of Graphical User Interface using swing controls.

Course Outcomes:

1. Able to solve real world problems using OOP techniques.
2. Able to solve problems using java collection framework and I/O classes.
3. Able to create and access packages, interfaces and implement classes
4. Able to develop multithreaded applications with synchronization.
5. Able to design GUI based applications.

UNIT– I: Foundations of Java:
History of Java, Java Features, Variables, Data Types, Operators, Expressions, Control Statements. Elements of Java - Class, Object, Methods, Constructors and Access Modifiers, Generics, Inner classes, String class and Annotations.
OOP Principles: Encapsulation–concept, setter and getter method usage, this keyword. Inheritance concept, Inheritance Types, super keyword. Polymorphism – concept, Method Overriding usage and Type Casting. Abstraction – concept, abstract keyword and Interface.

UNIT–II: Exception Handling:
Exception and Error, Exception Types, Exception Handler, Exception Handling Clauses– try, catch, finally, throws and the throw statement, Built-in-Exceptions and Custom Exceptions.
Files and I/O Streams: The file class, Streams, The Byte Streams, Filtered Byte Streams, The Random Access File class.

UNIT – III: Packages
Defining a Package, CLASSPATH, Access Specifiers, importing packages. Few Utility Classes - String Tokenizer, BitSet, Date, Calendar, Random, Formatter, Scanner. Collections: Collections overview, Collection Interfaces, Collections Implementation Classes, Sorting in Collections, Comparable and Comparator Interfaces.

UNIT–IV: Multithreading:
Process and Thread, Differences between thread – based multitasking and process-based multitasking, Java thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication.
Java Database Connectivity: Types of Drivers, JDBC architecture, JDBC Classes and Interfaces, Basic steps in Developing JDBC Application, Creating a New Database and Table with JDBC.

UNIT– V:

GUI Programming with Swing–Introduction, limitations of AWT, MVC architecture, components, containers, Layout Manager Classes, Simple Applications using AWT and Swing.

Event Handling-The Delegation event model - Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes.

Suggested Readings:

1. Java The complete reference, 9thedition, Herbert Schildt, Mc Graw Hill Education(India) Pvt. Ltd.
2. Understanding Object-Oriented Programming with Java, updated edition, T.Budd, Pearson Education.

Reference Books:

1. An Introduction to programming and OOdesign using Java, J.Ninoand F.A.Hosch, John Wiley &sons
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.
4. Programming in Java, S.Malhotra, S.Chudhary, 2ndedition, Oxford Univ. Press.
5. Java Programming and Object-oriented Application Development, R. A.Johnson, Cengage Learning.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
IT612OE: OBJECT ORIENTED PROGRAMMING USING C++
(Open Elective – I)

Pre-requisites :

1. A course on "Computer Programming and Data Structures"
2. A course on "Object Oriented Programming Concepts"

Course Objectives:

1. Introduces Object Oriented Programming concepts using the C++ language.
2. Understand the principles of data abstraction, inheritance and polymorphism;
3. Implementation of the principles of virtual functions and polymorphism
4. Handling formatted I/O, unformatted I/O in C++ and implementation of exception handling

Course Outcomes:

1. Develop programs with reusability and understand OO functions
2. Develop programs for file handling, data abstraction, data hiding
3. Develop inheritance, overloading and exceptions in programming
4. Implement I/O operations and file handling
5. Develop applications for a range of problems using object-oriented programming techniques

UNIT–I:

Object-Oriented Thinking: Different paradigms for problem solving, need for OOP paradigm, differences between OOP and Procedure oriented programming, Overview of OOP concepts Abstraction, Encapsulation, Inheritance and Polymorphism.

C++ Basics: Structure of a C++ program, Data types, Declaration of variables, Expressions, Operators, Operator Precedence, Evaluation of expressions, Type conversions, Pointers, Arrays, Pointers and Arrays, Strings, Structures, References. Flow control statement- if, switch, while, for, do, break, continue, goto statements. Functions - Scope of variables, Parameter passing, Default arguments, inline functions, Recursive functions, Pointers to functions. Dynamic memory allocation and deallocation operators-new and delete, Preprocessor directives.

UNIT–II:

C++ Classes and Data Abstraction: Class definition, Class structure, Class objects, this pointer,Friendtoaclass,Staticclassmembers,Constantmemberfunctions,ConstructorsandDestructors, Dynamiccreationanddestructionofobjects,Dataabstraction,ADTandinformationhiding.

UNIT–III :

Inheritance: Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes, Access to the base class members, Base and Derived class construction, Destructors, Virtual baseclass.

Virtual Functions and Polymorphism: Static and Dynamic binding, virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes, Implications of polymorphic use of classes, Virtual destructors.

UNIT –IV:

C++ I/O: I/O using C functions, Stream classes hierarchy, Stream I/O, File streams and String streams, Overloading operators, Error handling during file operations, Formatted I/O.

UNIT–V:

Exception Handling: Benefits of exception handling, Throwing an exception, The try block, Catching an exception, Exception objects, Exception specifications, Stack unwinding, Rethrowing an exception, Catching all exceptions.

Suggested Readings:

1. The Complete Reference C++,4th Edition, Herbert Schildt, Tata Mc Graw Hill.
2. Problem solving with C++: The Object of Programming, 4th Edition, Walter Savitch, Pearson Education.

Reference Books:

1. B.Stroutstrup, The C++Programming Language, 3rd Edition, Pearson Education.
2. R.Lafore, Object Oriented Programming in C++,3rd Edition, Galigotia Publications Pvt Ltd.
3. T. Gaddis, J.Walters and G. Muganda, OOP in C++, 3rd Edition, Wiley Dream TechPress.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
ME731PC: OPTIMIZATION TECHNIQUES
(CSBS)

Course Objectives:

The student should be able learn

- various optimization techniques i.e simplex algorithm, revised simplex method, dual simplex method, Kuhn-Tucker conditions for solving Linear and Nonlinear programming Problems
- various project management techniques and different inventory control models
- the concepts and applications of Dynamic programming and Simulation techniques in the real world scenario

Course Outcomes:

Upon successful completion of this course, student should be able to

- Formulate a linear programming (LP) model for given problem and solve this problem by using Simplex techniques.
- Solve LP models using revised simplex and dual simplex methods and apply sensitivity analysis to evaluate the models
- Apply Kuhn-Tucker technique for solving nonlinear optimization problems and apply CPM/PERT techniques for solving Project management problems
- Solve deterministic and Probabilistic inventory control models and solve Geometric Programming Models
- Apply dynamic programming and simulation techniques for solving engineering problems

UNIT - I

Optimization techniques, model formulation, models, formulation of LPP, graphical solution, simplex techniques.

UNIT – II

Revised simplex method - duality theory - dual simplex method - sensitivity analysis – parametric programming

UNIT - III

Nonlinear programming problem - Kuhn-Tucker conditions, flow in networks- elementary graph theory - min cost flow problem - max flow problem - CPM/PERT

UNIT - IV

Scheduling and sequencing - sequencing models, single server and multiple server queuing models, deterministic inventory models - probabilistic inventory control models, geometric Programming**.**

UNIT - V

Game theory-competitive models, dynamic programming, simulation -applications- single and multi-channel queuing problems and inventory control models.

Text Books:

1. Kanthi Swarup, P.K. Gupta and Man Mohan, Operations Research, 14th Edition, Sultan chand and sons, New Delhi, 2008.
2. Rao. S. S., Engineering Optimization: Theory and Practice, John Wiley andSons publishers, Fourth edition, 2009.

Reference Books:

1. George Bernard Dantzig, Mukund Narain Thapa, Linear programming, Springer series in operations research, Third edition, 2003.
2. Taha, H.A., Operations Research: An Introduction, Pearson/Prentice Hall, Eighth Edition, 2007.
3. Pannerselvam, Operations Research, Prentice Hall of India, 2010.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
CB701PC: DATA ANALYTICS

Course Objectives:

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
- To understand the various search methods and visualization techniques.

Course Outcomes:

After completion of this course students will be able to

1 Understand the impact of data analytics for business decisions and strategy
2 Carry out data analysis/statistical analysis
3 To carry out standard data visualization and formal inference procedures
4 Design Data Architecture
5 Understand various Data Sources

UNIT - I

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data) and Data Processing & Processing.

UNIT - II

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modelling in Business, Databases & Types of Data and variables, Data Modelling Techniques, Missing Imputations etc. Need for Business Modelling.

UNIT - III

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc. Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIT - IV

Object Segmentation: Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc. Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction

UNIT - V

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS:

1. Student's Handbook for Associate Analytics –II,III
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

REFERENCE BOOKS:

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway Labs Jeffrey D Ullman Stanford Univ.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
MS711PE: LOGISTICS & SUPPLY CHAIN MANAGEMENT
(Professional Elective-IV)
(Computer Science & Business Systems)

Course Objectives: The Objectives of the Course are:

1. To developing an understanding of the key concepts applied in Logistics and Supply Chain Management.
2. ToprovideinsightsintotheroleofLogisticsandSupplyChainManagementinanOrganization.
3. To make them focus on Warehousing and Transportation techniques.
4. To gain knowledge in strategic issues related to supply chain management.
5. To expound the role of other functional areas for an effective Supply Chain.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand the history and various concepts of Logistics and Supply Chain Management.
2. ClassifyandcomparevariousprocessesandTechnologyusedinLogisticsandSupply Chain Management.
3. AnalyzeanddifferentiatevariousstrategiesinTransportationandWarehousinginLogisticsandSupplyChain Management.
4. AnalyzevariousStrategicissuesandmanufacturingtechniquesinrelationtoLogisticsandsupply chain management.
5. Develop best Network Design, Planning and Operation in Logistics and Supply Chain management.

UNIT-I: INTRODUCTION

Introduction to Supply Chain Management (SCM)- Concept, Evolution, Objectives, Importance and Function of SCM, Conceptual Framework of SCM, Process view of Supply Chain, Supply Chain Strategies, Drivers and Metrics of Supply Chain, Strategic Fit, Achieving Strategic Fit and Obstacles.

UNIT-II: LOGISTICS MANAGEMENT

LogisticsManagement,Inbound,InternalandOutboundLogisticsinSCM,LogisticsOrganization,DevelopmentofIntegratedLogisticsStrategy,3PL,4PL,ReverseLogistics.RoleandImportanceofInventoryinSC,JIT,VMI,Outsourcing, SEZ in India, Dry Ports in India, Custom House Agent(CHA)ICDS.

UNIT-III: TRANSPORTATION, PACKAGING AND WAREHOUSING

Transportation in Supply Chain, Transportation Formats, Modes of Transportation, Transportation Performance factors, Fleet Management, Multi model transport, Containerization, Transportation Performance factors, Vehicle Scheduling and Routing, Milk run and Cross docking Packaging- importance and role of packaging in SC. Warehousing- Types of Warehouses, Warehousing Operations, Warehouse Management systems, RFID/CRM.

UNIT-IV: STRATEGIC ISSUES IN SUPPLY CHAIN

Strategic Partnerships, Alliances and Collaborative advantage, Strategic relationships in-logistics,Bull whip effect, Benchmarking IssuesandProblems,Types,Methods,Process,LeanManufacturingAgileManufacturing.LawsrelatedtoTransportinIndia.

UNIT-V: SUPPLY CHAIN INTERFACE

SC Network Design, Distribution Network in Supply Chain, Factors influencing Design, Models in DistributionNetwork, Supply Chain Integration - Internal and External, Role of IT and HR in SCM, Retailing and SCM,Green SupplyChainManagement.

TEXT BOOKS:

1. Chandrasekaran. N, "Supply Chain Management Process, Systemand Practice", 2nd edition, OxfordUniversityPress,2012.
2. SunilChopra,PeterMeindlandD.V.Karla,"SupplyChainManagement,Strategy,PlanningandOperations", 6th edition, Pearsoneducation,2016.
3. B. Rajashekar and G.V.R.K. Acharyulu, "Logistics and Supply chain Management", Excel Books, 2009.

SUGGESTED READINGS:

1. Shah, J, "Supply Chain Management, Text and Cases", 2nd Ed., Pearson education, 2016.
2. JudyDickens,"SupplyChainPlanningandExecution", 1st edition,Willford Press,2019.
3. Richard B Chase, Ravi Shankar and F Robort Jacobs, "Operations and Supply Chain Management",15th edition,McGraw HillEducation,2018.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
MS712PE: DIGITAL MARKETTING
(Professional Elective-IV)
(Computer Science & Business Systems)

Course Objectives: The objectives of the course are:

1. To provide an understanding of the basic concepts of Digital Marketing.
2. To highlight the importance of various channels of Digital Marketing.
3. To impart knowledge of various aspects of marketing in digital era.
4. To elucidate the various aspects in search engine marketing and online advertising.
5. To highlight the impact of social media on marketing.

Course Outcomes: After completion of the course, students will be able to:

1. Understand evolution of digital marketing, its strategies and platforms.
2. Learn the relevance of digital marketing channels.
3. Learn the significance of digital marketing.
4. Understand the relevance of online advertising.
5. Understand the methods of measuring the digital media performance.

UNIT – I: INTRODUCTION TO DIGITAL MARKETING

Concept, Need and Scope of Digital Marketing, Comparison of Marketing and Digital Marketing, Components of Digital Marketing, Benefits of Digital Marketing, Digital Marketing Platforms and Strategies, Digital Marketing Trends.

UNIT – II: CHANNELS OF DIGITAL MARKETS

Digital Marketing: Website Marketing, Search Engine Marketing, Online Advertising, Email Marketing, Blog Marketing, Social Media Marketing, Audio, Video and Interactive Marketing, Online Public Relations, Mobile Marketing, Migrating from Traditional Channels to Digital Channels. Marketing in the Digital Era: Segmentation: Importance of Audience Segmentation, Use of Digital Media by different Segments. Organizational Characteristics, Purchasing Characteristics, Using Digital Media for Reach, Acquisition and Retention of New Customers, Digital Media for Customer Loyalty.

UNIT – III: DIGITAL MARKETING PLAN

Need of a Digital Marketing Plan, Elements of a Digital Marketing Plan: Marketing Plan, Executive Summary, Mission, Situational Analysis. Opportunities and Issues, Goals and Objectives, Marketing Strategy, Action Plan, Budget, Writing the Marketing Plan and Implementing the Plan.

UNIT–IV: SEARCH ENGINE MARKETING (SEM) AND ONLINE ADVERTISING

Importance of SEM, Understanding Web Search: Key Words, HTML Tags, Inbound Links. Search Engine Optimisation - Online Advertising VS Traditional Advertising. Payment Methods of Online Advertising: CPT (Cost-per-Thousand) and CPC (Cost-per click). Display of Ads: Choosing a Display Ad Format, Landing Page and its Importance.

UNIT – V: SOCIAL MEDIA MARKETING

Understanding social media, Social Networking with Facebook, LinkedIn, Blogging as a Social Medium, Micro blogging with Twitter, Social Sharing with YouTube, social media for Customer Reach, Acquisition and Retention. Measurement of Digital Media: Analyzing Digital Media Performance, Analyzing Website Performance, Analyzing Advertising Performance.

TEXT BOOKS:

1. Dinesh Kumar, Marketing in the Digital Age, Sage Publications, 2021.
2. Annmarie Hanlon, Digital Marketing: Strategic Planning & Integration, Sage Publications, 1e, 2019.
3. Chuck Hemann & Ken Burbary, Digital Marketing Analytics, Pearson, 2e, 2018.

SUGGESTED READINGS:

1. Judy Strauss & Raymond Frost, E-Marketing, Pearson, 2016.
2. Vandana Ahuja, Digital marketing, Oxford University Press 2015.
3. Michael R Solomon, Tracy Tuten, Social Media Marketing, Pearson, 1e, 2015.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
CD741PE: NATURAL LANGUAGE PROCESSING
(Professional Elective-IV)
(Common to CSBS & CSE (Data Science))

Prerequisites

- Data structures and compiler design.

Course Objectives

- Introduction to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms; and 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, Features.

UNIT-II:

Syntax I: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms.

UNIT-III:

Syntax II: Models for Ambiguity Resolution in Parsing, Multilingual Issues

Semantic Parsing I: Introduction, Semantic Interpretation, System Paradigms, Word Sense.

UNIT-IV:

Semantic Parsing II: Predicate-Argument Structure, Meaning Representation Systems.

UNIT-V:

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Bayesian parameter estimation, Language Model Adaptation, Language Models- class based, variable length, Bayesian topic based, 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

Reference Books:

1. Speech and Natural Language Processing - Daniel Jurafsky& James H Martin, Pearson Publications.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary..

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
CB741PE: BIG DATA ANALYTICS
(Professional Elective – IV)

Prerequisites: A course on "Data Structures".

Course Objectives

- The purpose of this course is to provide the students with the knowledge of Big data Analyticsprinciples and techniques.
- This course is also designed to give an exposure of the frontiers of Big data Analytics

Course Outcomes

1	Ability to explain the foundations, definitions, and challenges of Big Data and various Analytical tools
2	Ability to understand Big Data Technologies
3	Ability to program using HADOOP and Map reduce, NOSQL
4	Ability to learn HDFS Architecture, Hadoop Configuration, Map Reduce Framework
5	Ability to understand the importance of Big Data in Social Media and Mining.

UNIT – I

Introduction to Big Data: Big Data and its Importance – Four V's of Big Data – Drivers for Big Data – Introduction to Big Data Analytics – Big Data Analytics applications.

UNIT – II

Big Data Technologies: Hadoop's Parallel World – Data discovery – Open source technology for Big Data Analytics – cloud and Big Data –Predictive Analytics – Mobile Business Intelligence and Big Data

UNIT – III

Introduction Hadoop: Big Data – Apache Hadoop & Hadoop Eco System – Moving Data in and out of Hadoop – Understanding inputs and outputs of Map Reduce - Data Serialization.

UNIT – IV

Hadoop Architecture: Hadoop: RDBMS Vs Hadoop, Hadoop Overview, Hadoop distributors, HDFS, HDFS Daemons, Anatomy of File Write and Read., Name Node, Secondary Name Node, and Data Node, HDFS Architecture, Hadoop Configuration, Map Reduce Framework, Role of HBase in Big Data processing, HIVE, PIG.

UNIT – V

Data Analytics with R Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering, Social Media Analytics, Mobile Analytics, Big Data Analytics with BigR.

Suggested Readings:

1. Big Data Analytics, Seema Acharya, Subhasini Chellappan, Wiley 2015.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O"Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

Reference Books:

1. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013)
2. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, Tom Plunkett, Mark Hornick, McGraw-Hill/Osborne Media (2013), Oracle press.
3. Professional Hadoop Solutions, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley,ISBN: 9788126551071, 2015.
4. Understanding Big data, Chris Eaton, Dirk deroos et al. McGraw Hill, 2012.
5. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.
6. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with AdvancedAnalytics, Bill Franks, 1st Edition, Wiley and SAS Business Series, 2012.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
CB742PE: SOFTWARE TESTING METHODOLOGIES
(Professional Elective-IV)

Course Objectives:

- To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
- To develop skills in software test and management using. To study the fundamental concepts of software testing which includes objectives, process, criteria, strategies, and methods.
- To discuss various software testing types and levels of testing like black and white box testing along with levels unit test, integration, regression, and system testing.
- It also helps to learn the types of bugs, testing levels with which the student can very well identify a bugand correct as when it happens.
- It provides knowledge on transaction flow testing and data flow testing techniques so that the flow of the program is tested as well.
- To learn the domain testing, path testing and logic based testing to explore the testing process easier.

Course Outcomes :

1. Know the basic concepts of software testing and its essentials.
2. Able to identify Transaction Flow Structure, Transaction flow testing techniques-Inspections, Data Flow Model, Strategies
3. Use of program's control flow as a structural model is the corner stone of testing.
4. Plan and Design and develop the best test strategies in accordance to the development model.
5. Able to understand Graph Matrices and Application

UNIT – I: Introduction:

Purpose of testing-Goals of testing, Phases in a Tester's Mental life, Test design, Testing is everything, The Pesticide Paradox and the complexity Barrier, Dichotomies-Testing Versus Debugging, Function versus Structure, model for testing Overview, The Environment, The Progress, Bugs, Tests, Testing Levels, consequences of bugs, Importance of Bugs, The Nightmare List and When to stop Testing, 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 Data Flow, Domain Testing's :

Transaction Flow Testing: transaction flows-Definitions, Example, Usage, Implementation, Perspective, Complications, Transaction Flow Structure, Transaction flow testing techniques-Inspections, Reviews, Walkthroughs, Path Selection, Sensitization, Instrumentation, Test Databases .

Dataflow testing: Basics of dataflow testing-Motivations and Assumptions, Data Flow graphs, The Data Flow Model, Strategies in dataflow testing-Terminology, The Strategies, Slicing, Dicing, Data Flow, and Debugging, 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 :
Motivation, path products & path expression, Overview, Basic Concepts, Path Products, Path Sums, Distributive Laws, Absorption Laws, Loops, Identity Elements, A reduction procedure – Overview , Cross- Term Step, Parallel Term, Loop Term, Applications- How many P

aths in a Flow Graphs, Approximate Minimum Number of Paths, The Probability of Getting There, The Mean Processing Time of a Routine, Push/Pop, Get/Return, Limitations and Solutions, regular expressions & flow anomaly detection.
Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

UNIT – IV: State, State Graphs and Transition testing :
Motivational Overview, State graphs, States, Inputs and Transitions, Outputs, State Tables, Time Versus Sequence, Software Implementation. Good & bad state graphs-General State Bugs, Transition Bugs, Output Errors, Encoding Bugs, State Testing-Impact of Bugs, Principles, Limitations and Extensions, What to Model, Getting the Data, Tools, Testability tips-A Balm for Programmers, How Big, How small, Switches, Flags, and Unachievable Paths, Essential and Inessential Finite-State Behaviour, Design Guidelines.

UNIT – V: Graph Matrices and Application:
Motivational Overview, The Problem with Pictorial Graphs, Tool Building, Doing and Understanding Testing Theory, The Basic Algorithms, Matrix of graph-Basic Principles, A simple Weight, Relations-Properties of Relations, Equivalence Relations, Partial Ordering Relations, Power of a Matrix-Principles, Matrix Power and Products, The set of all Paths, Loops, Partition Algorithms, Breaking Loops and Applications. Node reduction algorithm - Some Matrix Properties, The Algorithm, Applications, Building tools. (Student should be given an exposure to a tool like JMeter or Win-runner).

SUGGESTED READINGS:
1. Boris Beizer , “Software Testing techniques”, Dreamtech, second edition.
2. Dr. K. V. K. K. Prasad, “Software Testing Tools”, Dreamtech.

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

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
MS713PE: SERVICES SCIENCE AND SERVICE ORIENTED MANAGEMENT
(Professional Elective – V)
(**Computer Science & Business Systems**)

Course Objectives: The objectives of the course are:

1. To know the basics about Services, its role, and characteristics.
2. To provide a comprehensive understanding of service design principles and practices.
3. To provide students with a comprehensive understanding of quality and yield management principles and practices in various industries.
4. To provide students with a comprehensive understanding of service guarantee and service recovery principles and practices.
5. To learn about need to bring the innovations in Services and Services Marketing.

Course Outcomes: After Completion of the Course, Students will be able to:

1. Understand concepts of services and its significance in the economy and society and distinguish it from goods.
2. Understand the service strategy, design, and development.
3. Assess and enhance service quality using the SERVQUAL framework and other quality tools.
4. Comprehend ways to design services and able to understand service guarantee, recovery, and failures.
5. Forecast the service demand, supply, and facilitate various methods to operate and manage services.

UNIT – I: INTRODUCTION TO SERVICES

Introduction to the course, introduction to service operations, role of service in economy and society, introduction to Indian service sector, differences between services and operations, service package, characteristics, various frameworks to design service operation system, kind of service encounter, importance of encounters.

UNIT – II: SERVICE DESIGN

Service-Dominant Logic, Goods-Dominant logic to Service-Dominant logic, Value Co- creation, Customer Journey and Service Design, Design Thinking methods to aid Service Design, Development of Strategic Service Vision (SSV), Data Envelopment Analysis, NSD cycle, Service Blueprinting, Elements of service delivery system.

UNIT– III: QUALITY AND YIELD MANAGEMENT

Software quality, Process analysis, Process improvement, service facility management, Models of facility locations (Huff's retail model), role of service-scape in layout design, SERVQUAL, walk through audit, dimensions of service quality & other quality tools.

UNIT – IV: SERVICE GUARANTEE & SERVICE RECOVERY

Service guarantee, benefits, types, design of service of guarantees, service failure, service recovery, strategy, customer response analysis.

UNIT - V: FORECASTING, MANAGING CAPACITY, AND FACILITIES

Forecasting Demand for Services, review of different types of forecasting methods, managing capacity and demand: Strategies for matching capacity and demand, psychology of waiting, application of various tools used in managing waiting line in services, managing facilitating Goods, review of inventory models, role of inventory in services.

TEXT BOOKS:

1. Sanjeev Bordoloi, James Fitzsimmons & Mona Fitzsimmons (2023), Service Management: Operations, Strategy, Information Technology, 10th edition, McGraw Hill publications.
2. Valarie Zeithaml, Mary Jo Bitner, Dwayne Gremler and Martin Mende (2024).Services marketing: Integrating customer focus across the firm. 8th edition, McGraw Hill.
3. Lovelock, C. (2011). Services Marketing, 7/e. Pearson Education India.

REFERENCE BOOKS:

1. Reason, Ben, and Lovlie, Lavrans, (2016) Service Design for Business: A Practical Guide to Optimizing the Customer Experience, Pan Macmillan India, Chesbrough, H.
2. Chesbrough, H. (2010). Open services innovation: Rethinking your business to grow and compete in a new era. John Wiley & Sons.
3. John R. Bryson, Jon Sundbo, Lars Fuglsang, Peter Daniels (2020). Service Management: Theory and Practice, Springer Publications.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
CB751PE: DIGITAL PAYMENT SYSTEMS (Professional Elective – V)

Course Objectives

- Discuss the players and processes involved in e-payments.
- Discuss the different categories and potential uses of smart cards.

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. Able to understand Off-line data authentication, Processing restrictions, Cardholder Verification
5. Understand for Deriving ICC specifications by issuers, Selection criteria of the ICC architecture

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

Suggested Readings:

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 HiteshTewari, 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

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
CB752PE: IMAGE PROCESSING (Professional Elective – V)

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 ofDigital Signal Processing is desirable.
- A course on "Computational Mathematics"
- A course on "Computer Oriented Statistical Methods".

Course Objectives

- Provide a theoretical and mathematical foundation of fundamental Digital Image Processingconcepts.
- The topics include image acquisition sampling and quantization; pre-processing; enhancement; restoration; segmentation; and compression.

Course Outcomes

1. Ability to understand the basic concepts of two-dimensional signal acquisition, sampling, and quantization.
2. Ability to learn Image Enhancement in Spatial Domain Point Processing Filtering techniques.
3. Ability to understand Image restoration techniques
4. Ability to learn Image enhancement, segmentation, restoration and
5. Ability to understand 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, LeastMean 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 CompressionModels, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

Suggested Readings:

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, 2004.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
CB753PE: SOCIAL MEDIA ANALYTICS (Professional Elective – V)

Course Objectives

- Knowledge on social media and its analytics

Course Outcomes

1. Understanding characteristics and types of social media
2. Knowledge on layers of social media analytics
3. Apply text analysis tools on social media data
4. Understand the significance of action analytics
5. Knowledge on Social Media 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 Hyperlinks, Hyperlink Analytics, Types of Hyperlink Analytics, Hyperlink Analytics Tools. **Case Study**: Hyperlinks and Viral YouTube Videos.

Suggested Readings:

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, Avinash Kohirkar, Pearson Education.
2. Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics, Marshall Sponder, MGH.
3. Big Data and Analytics, Seema Acharya, Subhasinin Chellappan, Wiley Publications.
4. Big Data, Black Book^{tm}, Dreamtech Press, 2015 Edition.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
CS754PE: BLOCKCHAIN TECHNOLOGY (Professional Elective – V)
(COMMON TO CSE, IT, CSBS)

Prerequisites:

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

Course Objectives:

- To Introduce block chain technology and Cryptocurrency

Course Outcomes:

- Learn about research advances related to one of the most popular technological areas today.

UNIT- I

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

UNIT- II

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

UNIT- III

Block chain Science: Grid coin, Folding coin, Block chain Genomics, Bit coin MOOCs

UNIT - IV

Currency, Token, Tokenizing, Campus coin, Coin drop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency

UNIT - V

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

TEXTBOOK:

1. Blockchain Blue print for Economy by Melanie Swan

REFERENCE:

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition, by Daniel Drescher

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
MS721OE: Enterprise Resource Planning
Open Elective – II
(Computer Science & Business Systems)

Course Objectives: The objectives of the course are:

1. To provide a contemporary and forward-looking view on the theory and practice of Enterprise Resource Planning.
2. To emphasize 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 enable students understand the process of 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: After Completion of the Course, Students will be able to:

1. Demonstrate a good understanding of basic in Enterprise Systems.
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. Understand how to handle integration of ERP into organization culture.

UNIT – I: INTRODUCTION

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: ERP AND RELATED TECHNOLOGIES

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 MARKET PLACE & FUNCTIONAL MODULES

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

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

ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture.

TEXT BOOKS:

1. Alexis Leon, ERP demystified, second Edition Tata McGraw-Hill, 2015.
2. Jyotindra Zaveri, Enterprise Resource planning (ERP), Himalaya publishing house, New Delhi,2009
3. Mary Summer, “Enterprise Resource Planning”- Pearson Education 2005.

REFERENCE BOOKS:

1. Odd Joran Sagegg, ERP systems for Manufacturing Supply Chains: Applications, Configuration and Performance, Auerbach Publications, 2020.
2. Vinod Kumar Garg and Venkita Krishnan N K, “Enterprise Resource Planning Concepts and Practice”, PHI. Second Edition 2011.
3. Mahadeo Jaiswal and Ganesh Vanapalli, ERP Macmillan India, 2009.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
IT722OE: SCRIPTING LANGUAGES
(Open Elective – II)

Pre-requisites :

1. A course on "Computer Programming and Data Structures"
2. A course on "Object Oriented Programming Concepts"

Course Objectives:

1. This course introduces the script programming paradigm
2. Introduces scripting languages such as Perl, Ruby and TCL.
3. Learning TCL

Course Outcomes:

1. Comprehend the differences between typical scripting languages and typical system and application programming languages.
2. Gain knowledge of the strengths and weakness of Ruby
3. Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem.
4. Acquire programming g skills in Advanced Perl

UNIT – I : Introduction :

Ruby, Rails, The structure and Excution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Webservers, SOAP and webservices
RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling

UNIT – II : Extending Ruby :

Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System,Embedding Ruby to Other Languages, Embedding a Ruby Interperter

UNIT – III :

Introduction to PERL and Scripting

Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT – IV :

Advanced perl

Finer points of looping, pack and unpack, filesystem, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT – V : TCL :

TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface.

Tk : Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

Suggested Readings :

1. The World of Scripting Languages, David Barron,Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pramatic Programmers guide by Dabve Thomas Second edition

Reference Books :

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J.Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
CB751PC: DATA ANALYTICS LAB

Course Objectives:

- To learn the principles and methods of statistical analysis
- To explore the fundamental concepts of preprocessing Methods
- Discover interesting patterns, analyze supervised and unsupervised models and estimate
- The accuracy of the algorithms.
- To understand the various visualization techniques.

Course Outcomes :

1. Implement numerical and Statistical analysis on various data source
2. Apply Data Preprocessing Methods on Raw Data
3. Implement Regression Techniques on data for Prediction
4. Implement and evaluate the performance of Supervised and Unsupervised Models
5. Implementation of Data visualization techniques

List of Experiments:

1. To perform data import/export (CSV,XLS,TXT) operations using Data frames in Python.
2. To perform statistical operations (Mean, Median, Mode and Standard deviation) using python
3. To get the input from user and perform numerical operations (MAX, MIN, AVG, SUMMARY)
4. To perform data pre-processing operations i) Handling Missing data ii) Min-Max normalization
5. Implementation of Tree Building-Linear Regression
6. Implementation of Tree Building-Logistic Regression
7. Implementation of KN classification and plot the result
8. To Perform K-Means Clustering operations and visualize for iris Data set
9. Implementation of Tree Building –Decision Tree Algorithm
10. Implementation of Tree Multiple Decision Trees
11. Implementation of Time Series Models
12. Implementation of Data visualization techniques (Pixel-Oriented, Geometric, etc..) using python

TEXT BOOKS:

1. Student’s Handbook for Associate Analytics
2. Data Mining Concepts and Techniques , Han, Kamber , 3 rd Edition , Morgan Kaufmann Publishers

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
ME761PC: OPTIMIZATION TECHNIQUES LAB

Course Objectives:

The objectives of the course is to make the students

- Learn basics of operations research using both linear and non-linear programming
- Focus on convex optimization and non- convex function optimization though some techniques
- Provide adequate introduction to linear algebra and probability theory
- Learn to frame engineering minima maxima problems in the framework of optimization problems.

Course Outcomes:

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

- Understand the basic principles and concepts of Python
- Summarize various optimization techniques like LPP models.
- Explore the applicability of programming skills in Python.
- Analyze the transportation, inventory and assignment problems.
- Explain the concepts of sequencing, game theory and dynamic programming

List of Experiments:

1. Write a Python program to find out when given an array of size N, the task is to partition the given array into two subsets such that the average of all the elements in both subsets is equal. If no suchpartition exists print -1. Otherwise, print the partitions. If multiple solutions exist, print the solution where the length of the first subset is minimum. If there is still a tie then print the partitions where the first subset is lexicographically smallest.

2. write a Python program to find out when given an array of positive elements, you have to flip the sign of some of its elements such that the resultant sum of the elements of array should be minimumnon-negative (as close to zero as possible). Return the minimum no. of elements whose sign needsto be flipped such that the resultant sum is minimum non-negative. Note that the sum of all the arrayelements will not exceed 10^4.

3. Write a Python program to find out when given a two-dimensional grid, each cell of which contains integer cost which represents a cost to traverse through that cell. The task is to find the maximum cost path from the bottom-left corner to the top-right corner.

4. Write a Python program to find out when given an array of non-negative integers arr[], the task is to find a pair (n, r) such that ${}^{n}Pr$ is maximum possible and $r \leq n$.

5. Write a Python program to find out when given an array of non-negative integers arr[], the task is to find a pair (n, r) such that ${}^{n}Pr$ is minimum possible and $r \leq n$.
6. Linear Programming Problem: (Use TORA)

A store sells men's and women's tennis shoes. It makes a profit of $1 per pair of men's shoes and

$1.20 per pair of women's shoes. It takes two minutes of a salesperson's time and two minutes of a cashier's time to sell a pair of men's shoes. It takes three minutes of a salesperson's time and one minute of a cashier's time per pair of women's shoes. The store is open eight hours per day, during which time there are two salespersons and one cashier on duty. How many pairs of shoes of each type should the store sell in order to maximize profit each day?

7. QUEUING PROBLEM (Use TORA)

A super market has two girls ringing up sales at the counters. If the service time for each customeris exponential with mean 4 minutes, and if people arrive 3 in a poison fashion at the 10/hour.

8. SEQUENCING PROBLEM (Use TORA)

We have five jobs each of which must go through two machines in the order BA, processing timesare given in the table below.

Job	1	2	3	4	5
Machine A	10	2	18	6	20
Machine B	4	12	14	16	8

Determine a sequence for the five jobs that will minimize the total elapsed time. Also compute idletimes for each of the machine

9. GAME THEORY (Use TORA)

Using the dominance property obtain the optimal strategy for both the players and determine the value of game. The payoff matrix for player A is given.

	Player - B					
Player-A		I	II	III	IV	V
	I	2	4	3	8	4
	II	5	6	8	7	8
	III	6	7	9	8	7
	IV	4	2	8	4	3

10. TRANSPORTATION PROBLEM (Use TORA)

A Company has three plants at locations A,B and C which supply to warehouses located at D,E,F,G and H. monthly plant capacities are 800,500 and 900 respectively. Monthly warehouse requirements are 400, 500,400 and 800 units respectively. Unit transportation cost in rupees is given below.

		Ware Houses				
		D	E	F	G	H
Plant	A	5	8	6	6	3
	B	4	7	7	6	5
	C	8	4	6	6	4

Determine an optimum distribution for the company in order to minimize the total transportation cost.

11. DYNAMIC PROGRAMMING PROBLEM

Given an array arr[] of N integers, the task is to sort the array in non-decreasing order by performing the minimum number of operations. In a single operation, an element of the array can either be incremented or decremented by 1. Print the minimum number of operations required.

12. INVENTORY PROBLEM (USE:LINGO)

A dealer supplies you the following information with regards to any product that he deals in annual demand =10,000 units, ordering cost Rs. 10/order, Price Rs. 20/unit. Inventory carrying cost is 20% of the value of inventory per year. The dealer is considering the possibility of allowing some back orders to occurs. He has estimated that the annual cost of back ordering will be 25% of the value of inventory.

What should be the optimum no of units he should buy in 1lot?

What quantity of the product should be allowed to be backordered

What would be the max quantity of inventory at any time of year

Would you recommend allowing backordering? If so what would be the annual cost saving by adopting the policy of backordering.

TEXT BOOKS

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008.
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.

REFERENCE BOOKS:

1. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008.
2. Hitler Libermann Operations Research: McGraw Hill Pub. 2009.
3. Pannerselvam, Operations Research: Prentice Hall of India 2010.
4. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VIII Semester Syllabus
MS802HS: HUMAN RESOURCE MANAGEMENT
(Computer Science &Business Systems)

Course Objectives: The objectives of the course are:

1. To make the students understand about Human Resource Management.
2. To enable the students understand the process of Recruitment and Selection.
3. To disseminate knowledge about training methods and importance of performance management.
4. To acquaint the students regarding compensation and employee welfare measures.
5. To create awareness on Grievance Procedure.

Course Outcomes: After completion of the course the students will be able to:

1. Understand the importance of Human Resource Management in the organization.
2. Learn the process of Recruitment and selection.
3. Gain knowledge on various methods of training and development and need for performance management.
4. Know about employee welfare measures Compensation management.
5. Understand the Grievance handling procedure.

UNIT - I: INTRODUCTION OF HRM

Introduction to HRM –Importance of HRM– HR Role and responsibilities, Globalization & Competition Trends, Workforce and Demographic Trends, Economic Challenges, High Performance Work Systems, Equal Employment Opportunity, HR Score Card developed.

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 –Employee Testing and Selection – Basic types of Interviews – Errors in Interviews.

UNIT - III: TRAINING AND DEVELOPMENT

Importance of Training and Development –Training process - Analyzing Training needs and Designing the training program – Implementation of training programmes – training methods – Management development process – Evaluation of training and development programmes, Career Development, Stages of Career Development, Crisis Management.

Performance Management - Concept of Performance management and performance appraisal, the performance appraisal process, Appraisal Methods: Traditional and Modern Methods.

UNIT - IV: COMPENSATION AND EMPLOYEE WELFARE

Basic factors in determining pay rates – Job evaluation methods- Establishing pay rates – Pricing Managerial and Professional Jobs – Performance based pay –Benefits– Insurance – Retirement Benefits – Employee Welfare facilities. Salient Features of Workmen Compensation Act,1923 and Minimum Wages Act,1948.

UNIT - V: INDUSTRIAL RELATIONS

Employee Relations – Labour Movement – Collective Bargaining Process – Grievances – Grievances handling procedure – Employee Separation, Sexual harassment, IPC Section 354A.

TEXT BOOKS:

1. Aswathappa, Human Resource Management, Text and Cases, 9th Edition, TMH, 2021.
2. Gary Dessler, Biju Varkkey, Human Resource Management, 4e, Pearson 2017.
3. Robert L. Mathis, John H. Jackson, ManasRanjan Tripathy, Human Resource Management, Cengage Learning 2016.

REFERENCE BOOKS:

1. Sharon Pande and Swapnalekha Basak, Human Resource Management, Text and Cases, Vikas Publishing, 2e, 2015.
2. Uday Kumar Haldar, Juthika Sarkar, Human Resource Management, Oxford University Press2013.
3. C.B. Mamoria, V.S.P Rao, Personnel Management: Text and Cases, Himalaya Publishing House; 13e, 2012.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VIII Semester Syllabus
MS811PE: INNOVATION IP MANAGEMENT AND ENTREPRENEURSHIP
(Professional Elective–VI)
(**Computer Science & Business Systems**)

Course Objectives: The objectives of the course are:

1. To develop entrepreneurship skills of commercial appreciation by allocating 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 nature, scope and differences of IP, its different utilities and approaches.
4. The course will manage and strategize IP lifecycle effectively throughout the journey of start-up, in a time when it is aspired highly by the economy and society.
5. Participants will learn the fundamentals and advanced strategies of IP. They will be given the opportunity for understanding the same in the MSME sector. They also learn about women entrepreneurship.

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

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. Describe the fundamentals of intellectual property rights and legislation.
5. Analyze the problems of MSME and role of women entrepreneurs.

UNIT-I: ENTREPRENEURSHIP

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

UNIT-II: FORMULATION OF BUSINESS PLAN

Introduction, Business model canvas, Elements of business plan and its salient features, Technical analysis, Profitability and financial analysis, Marketing analysis, Executive summary. Choice of technology and collaborative interactions, Sources of finance for startups, Government Initiatives: Incubators, research parks, Various Government policies.

UNIT-III: INNOVATION

Introduction to innovation, Creativity, Different types of innovation, Open innovation, Adapt ability of an innovation, Innovation vs. Invention, Divergent and convergent thinking, Idea generation, Idea validation, Idea protection, Necessity of innovation in current business world.

UNIT-IV: IPR AND TECHNICAL INVENTIONS

Introduction, importance of Intellectual Property, Different types of IP, Copyrights, Trademarks, Geographical Indications, Trade secrets, Patents- types of patents Transforming IP into Economy; IP protection in developed nations, and developing nations. Position of India in IP protection (Agriculture, Pharmaceutical and engineering sectors). Protection of Various aspects of Embodied Inventions; Integrated circuit designs protection, Software Inventions or algorithms.

UNIT-V: IP STRATEGY AND ENTREPRENEURSHIP

IP strategy for start-up and MSME, IP transaction, IP valuation, Entrepreneurship & IP strategy, Fee relaxations for patents for Start-ups and small entities. Women Entrepreneurship – Challenges faced by women entrepreneurs, Strategies to develop Women Entrepreneurs, Institutions supporting Women Entrepreneurship in India.

TEXTBOOKS:

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,secondedition,WIPOPublicationNo.888,Switzerland.

REFERENCEBOOKS:

1. Berman, Ideas to Assets, Wiley publications.
2. Richard Dorf & Thomas Byers, Technology ventures from idea to enterprise,2nd edition.
3. Bosworth D. &Webster E,The Management of Intellectual Property, Edward Elgar.

ADDITIONALREADING:WIPO-http://www.wipo.int/patents/en/

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VIII Semester Syllabus
CS863PE: DEEP LEARNING (Professional Elective – VI)
(Common to CSE, IT, CSBS)

Course Objectives:

- To introduce the foundations of Artificial Neural Networks
- To acquire the knowledge on Deep Learning Concepts
- To learn various types of Artificial Neural Networks
- To gain knowledge to apply optimization strategies

Course Outcomes:

- Ability to understand the concepts of Neural Networks
- Ability to select the Learning Networks in modeling real world systems
- Ability to use an efficient algorithm for Deep Models
- Ability to apply optimization strategies for large scale applications

UNIT-I

Artificial Neural Networks Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

UNIT-II

Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks- Introduction to various networks.

UNIT - III

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feedforward networks, Gradient-based learning, Hidden Units, Architecture Design, Back-Propagation, and Other Differentiation Algorithms

UNIT - IV

Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization, and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier

UNIT - V

Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Optimization Strategies and Meta-algorithms.

Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing

TEXTBOOKS:

1. Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VIII Semester Syllabus
CB861PE: DECISION SUPPORT SYSTEMS (Professional Elective – VI)

Course Objectives

- To introduce decision support systems
- Show their relationship to other computer-based information systems, demonstrate DSS development approaches.
- 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 modeling.
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, Modeling, 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

Modeling and Analysis: MSS Modeling; Static and Dynamic Models; Certainty, Uncertainty, and Risk; Influence Diagrams; MSS Modeling 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.

Suggested Readings:

1. Efraim Turban and Jay E. Aronson. Decision Support Systems and Intelligent Systems, 8thedition, 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 HardDecisions, 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, HarvardUniversity Press, 1996.
5. Decision Support Systems Hyperbook, Power, D.J., accessed August, 2006

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VIII Semester Syllabus
CB862PE: DATA VISUALIZATION TECHNIQUES
(Professional Elective – VI)

Course Objectives

- To understand various data visualization techniques.

Course Outcomes

1. Visualize the objects in different dimensions.
2. Design and process the data for Virtualization.
3. Apply the visualization techniques in physical sciences, computer science, applied mathematics and medical science.
4. Able to understand Single Document Visualizations -Document Collection Visualizations
5. Apply the virtualization techniques for research projects (K1, K3).

UNIT – I

Introduction and Data Foundation: Basics - Relationship between Visualization and Other Fields - The Visualization Process - Pseudo code Conventions - The Scatter plot. Data Foundation - Types of Data - Structure within and between Records - Data Pre-processing - Data Sets

UNIT – II

Foundations for Visualization: Visualization stages - Semiology of Graphical Symbols - The Eight Visual Variables - Historical Perspective - Taxonomies - Experimental Semiotics based on Perception Gibson‘s Affordance theory – A Model of Perceptual Processing.

UNIT – III

Visualization Techniques: Spatial Data: One-Dimensional Data - Two-Dimensional Data – Three- Dimensional Data - Dynamic Data - Combining Techniques.

Geospatial Data: Visualizing Spatial Data, Visualization of Point Data -Visualization of Line Data - Visualization of Area Data - Other Issues in Geospatial Data Visualization

Multivariate Data: Point-Based Techniques - Line- Based Techniques - Region-Based Techniques - Combinations of Techniques – Trees Displaying Hierarchical Structures – Graphics and Networks- Displaying Arbitrary Graphs/Networks.

UNIT – IV

Interaction Concepts and Techniques: Text and Document Visualization: Introduction - Levels of Text Representations - The Vector Space Model - Single Document Visualizations - Document Collection Visualizations - Extended Text Visualizations.

Interaction Concepts: Interaction Operators - Interaction Operands and Spaces - A Unified Framework. **Interaction Techniques**: Screen Space - Object-Space -Data Space
Attribute Space- Data Structure Space - Visualization Structure - Animating Transformations - Interaction Control

UNIT – V

Research Directions in Virtualizations: Steps in designing Visualizations – Problems in designing effective Visualizations- Issues of Data. Issues of Cognition, Perception, and Reasoning. Issues of System Design Evaluation, Hardware and Applications.

Suggested Readings:

1. Matthew Ward, Georges Grinstein and Daniel Keim, "Interactive Data Visualization Foundations, Techniques, Applications", 2010.
2. Colin Ware, "Information Visualization Perception for Design", 2nd edition, Margon KaufmannPublishers, 2004.

Reference Books:

1. Robert Spence "Information visualization – Design for interaction", Pearson Education, 2 ndEdition, 2007.
2. Alexandru C. Telea, "Data Visualization: Principles and Practice," A. K. Peters Ltd, 2008.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VIII Semester Syllabus
CB863PE: SERVICE ORIENTED ARCHITECTURES
(Professional Elective – VI)

Course Objectives

- To establish essential coverage of service oriented architectural models and its underlying design paradigm, along with documentation of the methodology.

Course Outcomes

1. Understand case studies of service-oriented architectures.
2. Solving problems in service orientation.
3. Understanding principles of SOA.
4. Knowledge on SO Architectures.
5. Perform service-oriented analysis and design.

UNIT – I

Introduction, Case Study Backgrounds: Case Studies -Transit Line Systems, Inc., Midwest University Association.

UNIT – II

Understanding Service-Orientation: Introduction to Service-Orientation, Problems Solved by Service-Orientation, Effects of Service-Orientation on the Enterprise, Goals and Benefits of Service- Oriented Computing, Four Pillars of Service-Orientation

UNIT – III

Service-Orientation Principles: A profile for the Standardized Service Contract principle, A profile forthe Service Loose Coupling principle, A profile for the Service Abstraction principle, A profile for the Service Reusability principle, A profile for the Service Autonomy principle, A profile for the Service Statelessness principle, A profile for the Service Discoverability principle, A profile for the Service Composability principle (Appendix-A of the Textbook)

UNIT – IV

Understanding SO Architectures: Introduction to SOA, The Four Characteristics of SOA, The Four Common Types of SOA, The End Result of Service-Orientation and SOA, SOA Project and Lifecycle Stages

UNIT – V

Service-Oriented Analysis and Design: Web Service Modeling Process, Decompose the Business Process (into Granular Actions), Filter Out Unsuitable Actions, Define Entity Service Candidates, Identify Process-Specific Logic, Apply Service-Orientation, Identify Service Composition Candidates, Analyze Processing Requirements, Define Utility Service Candidates, Define Micro service Candidates, Apply Service-Orientation, Revise Service Composition Candidates, Revise Capability Candidate Grouping

Suggested Readings:

1. Thomas Erl, Service-Oriented Architecture Concepts, Technology and Design, PH

Reference Books:

1. SOA in Practice: The Art of Distributed System Design Nicolai M. Josuttis, O'Reilly Media, Inc.
2. Java Web Service Architecture, James McGovern, Sameer Tyagi et al., Elsevier
3. Building Web Services with Java, 2nd Edition, S. Graham and others, Pearson Edn.
4. Java Web Services, D.A. Chappell & T. Jewell, O'Reilly,SPD.
5. Web Services, G. Alonso, F. Casati and others, Springer.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VIII Semester Syllabus

MS831OE: INNOVATION IP MANAGEMENT & ENTREPRENEURSHIP
(Open Elective – III)

Course Objectives: The objectives of the course are:

1. To develop entrepreneurship skills of commercial appreciation by allocating 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 nature, scope and differences of IP, its different utilities and approaches.
4. The course will manage and strategize IP lifecycle effectively throughout the journey of start-up, in a time when it is aspired highly by the economy and society.
5. Participants will learn the fundamentals and advanced strategies of IP. They will be given the opportunity for understanding the same in the MSME sector. They also learn about women entrepreneurship.

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

1. Describe the requirements and responsibilities put on management, board members and share holders 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. Describe the fundamentals of intellectual property rights and legislation.
5. Analyze the problems of MSME and role of women entrepreneurs.

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: FORMULATION OF BUSINESS PLAN

Introduction, Business model canvas, Elements of business plan and its salient features, Technical analysis, Profitability and financial analysis, Marketing analysis, Executive summary. Choice of technology and collaborative interactions, Sources of finance for startups, Government Initiatives: Incubators, research parks, Various Government policies.

UNIT-III: 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-IV: IPR AND TECHNICAL INVENTIONS

Introduction, importance of Intellectual Property, Different types of IP, Copyrights, Trademarks, Geographical Indications, Trade secrets, Patents- types of patents Transforming IP into Economy; IP protection in developed nations, and developing nations. Position of India in IP protection (Agriculture, Pharmaceutical and engineering sectors). Protection of Various aspects of Embodied Inventions; Integrated circuit designs protection, Software Inventions or algorithms.

UNIT-V: IP STRATEGY AND ENTREPRENEURSHIP

IP strategy for start-up and MSME,IP transaction, IP valuation, Entrepreneurship& IPstrategy,FeerelaxationsforpatentsforStart-upsandsmallentities.Women Entrepreneurship – Challenges faced by women entrepreneurs, Strategies to develop Women Entrepreneurs, Institutions supporting Women Entrepreneurship in India.

TEXTBOOKS:

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.

REFERENCEBOOKS:

1. Berman, Ideas to Assets, Wiley publications.
2. Richard Dorf & Thomas Byers, Technology ventures from idea to enterprise, 2nd edition.
3. Bosworth D. &Webster E, The Management of Intellectual Property, Edward Elgar.

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

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VIII Semester Syllabus

IT831OE: INTRODUCTION TO BIG DATA TECHNOLOGIES
(Open Elective – III)

Course Objectives:

1. The purpose of this course is to provide the students with knowledge of Big data Analytics principles and techniques.
2. This course is also designed to give an exposure of the frontiers of Big data Analytics

Course Outcomes:

1. Ability to explain the foundations, definitions, and challenges of Big Data and variou Analytical tools.
2. Ability to program using HADOOP and Map reduce, NOSQL
3. Ability to understand the importance of Hive and Pig in analyzing the data
4. Understand how to install and configure Oozie and NoSQL data management
5. Learn to implement ZooKeeper and Sqoop

UNIT – I :

Getting an Overview of Big Data

Big Data, History of Data Management – Evolution of Big Data, Structuring Big Data, Elements of Big Data, Big Data Analytics, Careers in Big Data, Future of Big Data

Technologies for Handling Big Data

Distributed and Parallel Computing for Big Data, Introducing Hadoop, Cloud Computing and Big Data, In-Memory Computing Technology for Big Data.

UNIT – II :

Understanding Hadoop Ecosystem

Hadoop Ecosystem, Hadoop Distributed File System, MapReduce, Hadoop YARN, Hbase, Hive, Pig and Pig Latin, Sqoop, ZooKeeper, Flume, Oozie

Understanding MapReduce Fundamentals and HBase

The MapReduce Framework, Techniques to Optimize MapReduce Jobs, Uses of MapReduce, Role of HBase in Big Data Processing

UNIT – III :

Exploring Hive

Introducing Hive, Getting Started with Hive, Data Types in Hive, Built-In Functions in Hive, Hive DDL, Data Manipulation in Hive, Data Retrieval Queries, Using JOINS in Hive

Analyzing Data with Pig

Introducing Pig, Running Pig, Getting Started with Pig Latin, Working with Operators in Pig, Working with Functions in Pig

UNIT – IV :

Using Oozie

Introducing Oozie, Installing and Configuring Oozie, Understanding the Oozie Workflow, Oozie Coordinator, Oozie Bundle, Oozie Parameterization with EL, Oozie Job Execution Model, Accessing Oozie, Oozie SLA

NoSQL Data Management

Introduction to NoSQL, Aggregate Data Models, Key Value Data Model, Document Databases, Relationships, Graph Databases, Schema-Less Databases, Materialized Views, Distribution Models, Sharding, MapReduce Partitioning and Combining, Composing MapReduce Calculations

UNIT – V :

ZooKeeper: Installing and Running ZooKeeper, An Example, Group Membership in ZooKeeper, Creating the Group, Joining a Group, Listing Members in a Group, The ZooKeeper Service, Data Model, Operations, Implementation, Consistency, Sessions, Building Applications with ZooKeeper, A Configuration, Service, The Resilient ZooKeeper Application, A Lock Service, More Distributed Data Structures and Protocols, ZooKeeper in Production

Sqoop: Getting Sqoop, Sqoop Connectors, A Sample Import, Generated Code, Imports: A Deeper Look, Working with Imported Data, Importing Large Objects, Performing an Export, Exports: A Deeper Look.

Suggested Readings :

1. Big data, black book, DreamTech Press, 2015
2. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O'Reilly Media, 2012.

Reference Books :

1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.
2. Simon Walkowiak, Big Data Analytics with R, Packt Publishing, ISBN: 9781786466457
3. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiley CIO Series, 2013.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.