

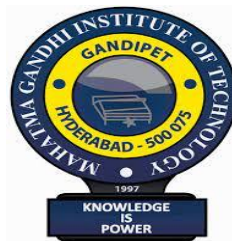
B.Tech.
in
**COMPUTER SCIENCE AND BUSINESS SYSTEMS
(CSBS)**

**Scheme of Instruction, Examination and Syllabi
of**

V to VIII Semesters

MR 21

Academic Year: 2023-24



MAHATMA GANDHI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

(Affiliated to JNTUH, Hyderabad; Eight UG Programs Accredited by NBA;

Accredited by NAAC with 'A++' Grade)

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MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
Scheme of Instruction and Examination B.Tech. V and VI Semester
B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
(Choice Based Credit System)
For the batch to be admitted in the academic year 2021-22

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	CS502PC	Data Science	3	0	0	30	70	3	3
2	MS503HS	Financial Management	3	0	0	30	70	3	3
3	CS507PC	Web Technologies	3	0	0	30	70	3	3
4	CS510PC	Computer Networks	3	0	0	30	70	3	3
5		Professional Elective – I	3	0	0	30	70	3	3
6		Professional Elective – II	3	0	0	30	70	3	3
7	MC501HS	Intellectual Property Rights	3	0	0	30	70	3	0
8	MC501ES	Artificial intelligence	3	0	0	30	70	3	0
9	CS552PC	Data Science Lab	0	0	3	30	70	3	1.5
10	CS556PC	Computer Networks & Web Technologies Lab	0	0	3	30	70	3	1.5
11	EN553HS	Finishing Schools-III (Advanced Communication Skills Lab)	0	0	2	30	70	3	1
Total Hours/Marks/Credits			24	0	8	330	770	--	22

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	CS602PC	Automata Theory and Compiler Design	3	1	0	30	70	3	4
2	CS606PC	Design and Analysis of Algorithms	3	1	0	30	70	3	4
3	ME631ES	Optimization Techniques	3	1	0	30	70	3	4
4		Professional Elective – III	3	0	0	30	70	3	3
5		Open Elective-I	2	0	0	30	70	3	2
6	MC602ES	Cyber Security	3	0	0	30	70	3	0
7	CS652PC	Algorithms and Compiler Design Lab	0	0	3	30	70	3	1.5
8		Professional Elective-III Lab	0	0	3	30	70	3	1.5
9	ME661ES	Optimization Techniques Lab	0	0	2	30	70	3	1
10	MA654BS	Finishing School – IV (Quantitative Aptitude & Analytical Ability)	0	0	2	30	70	3	1
Total Hours/Marks/Credits			17	3	10	300	700	--	22
11	MC601ESC	Environmental Science (For Lateral Entry Students)	3	0	0	30	70	3	0

L: Lecture **T:** Tutorial **D:** Drawing **P:** Practical

CIE - Continuous Internal Evaluation **SEE** - Semester End Examination

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
Scheme of Instruction and Examination B.Tech. VII and VIII Semester
B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
(Choice Based Credit System)
For the batch to be admitted in the academic year 2021-22

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	MS701HS	Marketing Management and Research	3	0	0	30	70	3	3
2	CS704PC	Design Thinking	3	0	0	30	70	3	3
3		Professional Elective –IV	3	0	0	30	70	3	3
4		Professional Elective –V	3	0	0	30	70	3	3
5		Open Elective – II	2	0	0	30	70	3	2
6	CS752PC	Product Design Lab	0	0	2	30	70	3	1
7	CS755PC	Industry Oriented Mini Project/ Summer Internship	0	0	4	-	100	-	2
8	CS756PC	Seminar	0	0	2	100	-	-	1
9	CS758PC	Project Stage – I	0	0	6	30	70	-	3
Total Hours/Marks/Credits			14	0	14	310	590		21

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	MS801HS	Human Resource Management	3	0	0	30	70	3	3
2		Professional Elective – VI	3	0	0	30	70	3	3
3		Open Elective – III	2	0	0	30	70	3	2
4	CS852PC	Project Stage – II	0	0	16	30	70	-	8
Total Hours/Marks/Credits			8	0	16	120	280		16

L: Lecture **T:** Tutorial **D:** Drawing **P:** Practical

CIE - Continuous Internal Evaluation **SEE** - Semester End Examination

***Note:** Industry Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit a report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

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

MC –Satisfactory/Unsatisfactory

Department of Information Technology**List of Open Electives Offered by IT & CSBS Departments:****Open Elective – I :**

IT521OE	Biometrics
IT522OE	Cyber Forensics
CS521OE	Data Structures

Open Elective – II :

IT621OE	Human Computer Interaction
CS621OE	Computer Networks
CS623OE	Java Programming

Open Elective – III :

IT721OE	Computer Graphics
CS721OE	Python Programming
CS723OE	Introduction to Machine Learning

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
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V SEMESTER

S.No	Course Code	Course Title	Instruction			Examination		Credits	
			Hours Per Week			Max. Marks			Duration of SEE inHours
			L	T	P/D	CIE	SEE		
1	CS502PC	Data Science	3	0	0	30	70	3	3
2	MS503HS	Financial Management	3	0	0	30	70	3	3
3	CS507PC	Web Technologies	3	0	0	30	70	3	3
4	CS510PC	Computer Networks	3	0	0	30	70	3	3
5		Professional Elective – I	3	0	0	30	70	3	3
6		Professional Elective – II	3	0	0	30	70	3	3
7	MC501HS	Intellectual Property Rights	3	0	0	30	70	3	0
8	MC501ES	Artificial intelligence	3	0	0	30	70	3	0
9	CS552PC	Data Science Lab	0	0	3	30	70	3	1.5
10	CS556PC	Computer Networks & Web Technologies Lab	0	0	3	30	70	3	1.5
11	EN553HS	Finishing Schools-III (Advanced Communication Skills Lab)	0	0	2	30	70	3	1
Total Hours/Marks/Credits			24	0	8	330	770	--	22

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

Professional Elective - I

MS511PE	Legal Aspects of Business and Ethics
CS511PE	Data Warehousing and Data Mining
CS512PE	Design Patterns
CS513PE	R-Programming
CS514PE	E-Commerce

Professional Elective-II

MS512PE	Behavioural Economics
MS513PE	Enterprise Resource Planning
MS514PE	Operations Management
CS521PE	Cloud Computing

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
CS502PC: DATA SCIENCE

Course Objectives

- To learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
- To exploring data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and effective communication
- To understand the basic knowledge of algorithms and reasonable programming experience and some familiarity with basic linear algebra and basic probability and statistics
- To identify the importance of recommendation systems and data visualization techniques

Course Outcomes

- Understand basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data
- Discuss the significance of exploratory data analysis (EDA) in data science and to apply basic tools (plots, graphs, summary statistics) to carry out EDA
- Apply basic machine learning algorithms and to identify common approaches used for Feature Generation
- Analyze fundamental mathematical and algorithmic ingredients that constitute a Recommendation Engine and to Build their own recommendation system using existing components

Unit – I

Introduction to Data Science, Big Data and Data Science hype and getting past the hype Datafication ,Current landscape of perspectives, Skill sets needed, Statistical Inference, Populations and samples, Statistical modeling, probability distributions, fitting a model - Intro to R

Unit – II

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

Unit – III

One More Machine Learning Algorithm and Usage in Applications - Motivating application: Filtering Spam - Why Linear Regression and k-NN are poor choices for Filtering Spam - Naive Bayes and why it works for Filtering Spam

Unit – IV

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

Unit – V

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

Suggested Readings:

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

Reference Books:

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

L	T	P	C
3	0	0	3

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
B. Tech. V Semester

MS503HS: Financial Management
(CSBS)

Course Objectives: The objectives of the course are:

- To develop a broad understanding of the Concept of Finance Functions and Time value of money.
- To learn the significance of Capital Budgeting techniques for the feasibility of projects.
- To understand the capital structure decisions taken by a finance manager in a Corporate.
- To develop knowledge on dividend policy decision and its relevance
- 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:

- Understand Goals of financial function
- Identify the significance of Investment criteria and decision process
- Understand and analyze capital structure
- Implement the Dividend Decisions in the interest of the stakeholders.
- 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 marginal cost 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; Major theories centered on the works of 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, 11 e, Vikas Publications, 2015.
2. Khan. M.Y, Jain P.K, Financial Management-Text and Problems, TMH, 2015.
3. James C Van Horne, Sanjay Dhamija, Financial Management and Policy, Pearson Education, New Delhi.

REFERENCE BOOKS:

1. Eugene F.Brigham Michael C. Ehrhardt, Financial Management, Cengage Learning, 12e, 2012.
2. Arindam Banerjee, Financial Management, Oxford Publications, 2016.
3. Rajesh Kothari, Financial Management A Contemporary Approach, Sage publications, 2017

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
CS507PC: WEB TECHNOLOGIES
(Common to CSE, IT, CSBS)

Prerequisites:

- A course on “Computer Programming and Data Structures”.
- A course on “Java Programming”

Course Objectives:

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

Course Outcomes:

- Gain knowledge of client-side scripting, validation of forms and AJAX programming.
- Understand what is XML and how to parse and use XML Data with Java
- Understand server-side scripting with PHP language
- Gain knowledge of Server-side programming with Java Servlets
- Gain knowledge of Server-side programming with JSP.

UNIT- I

HTML Common tags- List, Tables, images, forms, Frames, Cascading Style sheets.

Client-side Scripting: Introduction to Javascript, Javascript language – declaring variables, scope of variables, Objects, Functions, event handlers (onclick, onsubmit etc.), HTML Document Object Model, Form validation, Introduction to AJAX.

UNIT – II

XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, XML-Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

UNIT- III

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. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies

File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

UNIT – IV

Introduction to Servlets: Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

UNIT – V

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Scripting Elements, Directive Elements, Action Elements Implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP, Introduction to Content Management System(CMS).

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. Beginning Web Programming-Jon Duckett WROX.

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
CS510PC: COMPUTER NETWORKS
[Common to CSE, CSBS, CSE (AI&ML) & CSE (DS)]

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: Radiowaves, 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,

Example data link protocols: HDLC, PPP

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, DHCP,

Internetwork Routing: OSPF, BGP, Internet Multicasting.

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.

World Wide Web: Architectural Overview, Static Web pages, Dynamic web pages and Web applications, HTTP, Mobile Web.

Streaming audio and video: Digital Audio, Digital Video, Streaming Stored media, Streaming Live media, Real Time Conferencing.

Suggested Reading:

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 9 th Edition, Pearson Education 2010.
3. “TCP/IP Illustrated” by W. Richard Stevens,Addison-Wesley Professional;2 nd edition 2011.

L	T	P	C
3	0	0	3

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
B. Tech. V Semester
MS511PE: Legal Aspects of Business and Ethics (Professional Elective -I)
(CSBS)

Course Objectives: The objectives of the course are:

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

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

- Broad aspects of Companies Act, 2013
- Significant provisions of Indian Contract Act, 1872 and Sale of Goods Act, 1930
- The types of negotiable instruments and ways of endorsements and also the concept of GST
- Business ethics, and theories and principles of ethics.
- 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 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, 4e, Cengage Learning, 2016.
2. P.P.S. Gogna, Company Law, S. Chand, 2016.
3. CSV Murthy, Business Ethics (Text and Cases), Pub. By HPH
4. Nina Godbole & Sunit Belapure, Cyber Security, Wiley India, 2012.

REFERENCE BOOKS:

1. RSN Pillai, Bagavathi, Legal Aspects of Business, S. Chand, 2016.
2. Akhileshwar Pathak , Legal Aspects of Business, Tata McGraw Hill, 3e, 2011.\
3. Marianne M. Jennings, Cases in Business Ethics, Pubby Cengage Learning
4. 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
CS511PE: DATA WAREHOUSING AND DATA MINING (Professional Elective – I)

Course Objectives

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

Course Outcomes

- Students should be able to understand why the data warehouse in addition to database systems.
- Ability to perform the pre-processing of data and apply mining techniques on it.
- Ability to identify the association rules, classification and clusters in large data sets.
- Ability 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 Addictive 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 Steinbach, 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

CS512PE: 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 common problems faced during building an application
- This course covers all pattern types from creational to structural, behavioural to concurrency and highlights the scenarios when one pattern must be chosen over others.

Course Outcomes

- Understand the fundamental concepts of design patterns.
- Understand the significance of designing a document editor
- Use creational design patterns in software design for class instantiation
- Use structural, behavioural 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**

CS513PE: R PROGRAMMING (Professional Elective – I)

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

- Understand to use and program in the programming language R
- Understand to use R to solve statistical problems
- Implement and describe Monte Carlo the technology
- Implement minimize and maximize functions 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 Subtable, 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. Debugging: Fundamental Principles of Debugging, Why Use a Debugging Tool?, Using R Debugging Facilities, Moving Up in the World: More Convenient Debugging Tools, Ensuring Consistency in Debugging Simulation Code, Syntax and Runtime Errors, Running GDB on R Itself.

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 Golemund, 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
V Semester Syllabus**

CS514PE: 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 technologies interact.

Course Outcomes

- Ability to identify the business relationships between the organizations and their customers
- Ability to perform various transactions like payment, data transfer and etc.
- Define various electronic payment types and associated security risks and the ways to protect against them.

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, Elizabeth 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.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS**B.Tech. V Semester****MS512PE:Behavioral Economics****(Professional Elective–II)****(CSBS)**

Course Objectives: The Course objectives are:

- To provide students with an introduction to the scope and application of Behavioral Economics.
- To understand the behavior under risk and uncertainty
- To learn the models of individual decision
- To understand social preferences and relevant models
- 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:

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

UNIT–I:**Introduction**

What is behavioral economics? - 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:

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:

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 aversion models-reciprocity, models, evidence and policy implications.

UNIT-V:

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 Mc Millan Press.

REFERENCEBOOKS:

1. Alexander Rajko, Behaviour Economics and Business Ethics- Interrelation and Application, Rutledge, London, 2012
2. Steffan Heidel, Philosophical problems of Behavioural Economics, Routledge, 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

B.Tech. V Semester

MS513PE: Enterprise Resource Planning

Professional Elective – II

(CSBS)

Course Objectives: The objectives of the course are:

- To provide a contemporary and forward-looking view on the theory and practice of Enterprise Resource Planning
- To emphasize upon practice of theory in Applications and Practical Oriented approach.
- To train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth.
- To enable students understand the process of implementation of ERP.
- 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:

- Demonstrate a good understanding of basic in Enterprise Systems
- Analyze the strategic options for ERP identification and adoption.
- Design the ERP implementation strategies.
- Create reengineered business processes for successful ERP implementation.
- Understand how to handle integration of ERP into organization culture.

UNIT – I:

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

UNIT – II:

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

UNIT – III:

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

UNIT – IV:

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

UNIT – V:

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

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MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
B.Tech. V Semester
MS514PE: Operations Management
(Professional Elective–II)
(CSBS)

Course Objectives: The Objectives of the Course are:

- To give insights of operations management and its evolution.
- To provide an understanding on the Process Planning, Design, Process Layout, Types of Production systems and to comprehend the different ways of measuring Productivity.
- To develop Skills necessary to understand Work study and know the Techniques to Manage Inventory.
- To acquaint with inventory valuation models.
- To provide knowledge on Emerging Issues in Quality Management, Supply Chain and Project Management,

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

- Apply knowledge of basic Concepts of Operations Management for developing processes and improving Operational Performance.
- Develop aggregate capacity plans and Mater Production Schedule in operation environments and enabling the importance of facility location, layout and line balancing.
- Identify and eliminate nonessential operations and develop feasible method of performing a job by applying work study techniques.
- Calculate inventory levels and order quantities to make use of various inventory classification models.
- Advance cognizance on Emerging Issues in Operations Management

Unit–I

Introduction

Introduction to Operations Management - The Historical evolution of Operations Management- Scope of Operations Management - Interface between the Operation Systems and Systems of other Functional areas. Process Planning and Process Design ,Ergonomic Considerations, Production Planning and Control: Basic functions of Production Planning and Control, Production Cycle. Types of Production Systems - Project, Job Shop, Assembly, Batch and Continuous flow. Productivity-Measuring Productivity-Ways of improving Productivity. Recent Trends in Operations.

Unit-II

Scheduling and Control of Production Operations

Aggregate Planning, Master Production Schedule (MPS), Operations Scheduling, Product Sequencing: Sequencing of Products in Multi-Product Multi –Stage situations by using Johnson Rule and CDS method. Plant Location and Layout: Factors influencing Location, Different types of Layouts. Maintenance Management: Objectives, Preventive and Breakdown Maintenance, Failure Concept, Reliability, Replacement Policies.

Unit-III

Work Study

Work Study - Method Study and Work Measurement - Objectives of Work Study - Relationship of Time and Motion Study to Work Study-Basic Work Study procedure-Variou techniques in Method Study for identifying the most appropriate method. Work measurement - its uses and different methods, computation of allowance and Standard Time.

Unit-IV

Materials and Inventory Management

Objectives of Materials Management - Materials Requirement Planning [MRP-I], Manufacturing Resource Planning [MRP-II]- Sources of Supply of Materials-Selection, Evaluation and Performance of Suppliers .Vendor Rating, Make or Buy decisions. Value Analysis: Aims, Procedure, Advantages and Application areas. Inventory Control -Need for Inventory, EOQ Model, and Economic Production Quantity Model.

Unit-V

Emerging trends in operations Management

Nature - Strategic issues – Outsourcing - World Class Manufacturing - Total Quality Management - Supply Chain Management - Managing Service Operations - Project Management.

Text Books:

1. Stevenson J. William, “Operations Management”, 13th edition, Tata McGraw-Hill, 2017.
2. Panneerselvam R, “Production and Operations Management”, Prentice Hall India Learning Private Limited, 3rd edition, 2012.
3. B Mahadevan, “Operations Management: Theory and Practice”, Pearson Education India, 3rd edition, 2015.

Suggested Readings:

1. Jay Heizer, Barry Render, Chuck Munson, “Operations Management”, 12th edition, Pearson, 2020.
2. Richard Chase, Ravi Shanker, F. Robert Jacobs, “Operations and Supply Management”, McGraw Hill Education, 12th edition, 2010.
3. K Aswathappa, K Shridhara Bhat, “Production and Operations Management”, Himalaya Publishing House Pvt. Ltd, 2nd edition 2015.

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

CS521PE: 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

- Ability to understand various service delivery models of a cloud computing architecture.
- Ability to understand the ways in which the cloud can be programmed and deployed.
- 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

B.Tech. V Semester

MC501HS: Intellectual Property Rights

(Common to CSE, CSBS, CSD, CSE (AI&ML)& IT)

Course Objectives: The objectives of the course are:

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

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

- Gain knowledge on Intellectual property rights and their importance.
- Understand Indian and international Trademark Law and procedure for registration of Trademarks.
- Acquire knowledge on Copyright Law, and the privileges awarded to the copyright owners.
- Familiarized with the process of acquiring the patent and relevant laws.
- 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- Trademarks registration process – Trademark Infringement - Remedies for infringement in Trademarks-New developments in Trademark Law- International Trademarks Law.

UNIT III

Copyright

Copyrights-Fundamental 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

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 status-Liability for misappropriations of trade secrets, protection for submissions, trade secret litigation. New developments in Trade secrets Law- International Trade Secrets.

Law of Unfair competition: Passing off, Misappropriation, right of publicity, dilution of trademarks, product disparagement, false advertising.

Text Books:

1. Deborah. E. Bouchoux, Intellectual property, 4 e,Cengage learning India Pvt.Ltd., 2013
2. Prabuddha Ganguli, Intellectual property right, 8e,Tata McGraw Hill Publishing company, 2016
3. Dr.B.L.Wadehra, Law Relating to Intellectual Property,5 e, Universal Law Publishing Co. 2011.

References

1. Richard Stim, Intellectual Property, 3e Cengage learning India Pvt.Ltd., 2017
2. Vinod.V.Sopele, Asoka K.Ghosh,Managing Intellectual Property, 2 e,2010
3. Ananth Padmanabhan, Intellectual Property Rights – Infringement and Remedies, Lexis Nexis Publishers, 2012

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS

V Semester Syllabus

MC501ES/ MC601ES: ARTIFICIAL INTELLIGENCE

(Common to all Branches except CSE(AI&ML))

Course Objectives:

- To learn the distinction between optimal reasoning Vs. human like reasoning
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

Course Outcomes:

- Ability to formulate an efficient problem space for a problem expressed in natural language.
- Select a search algorithm for a problem and estimate its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique for a given problem.
- Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.

UNIT - I

Introduction: AI Definition, Agents and Environments, Structure of Agents, Types of Agents. Problem Solving Agents: Problem spaces, states, goals and operators.

Uninformed Search Strategies: Breadth First Search, Depth First Search, Depth Limited Search, Iterative Deepening depth first search, Bidirectional Search.

UNIT – II

Informed Search: Heuristic Search strategies, Hill Climbing, A*, Hill climbing search.

Game Playing: Adversarial Searches. Two player games. Min-max Search: Algorithm, Problems. Draw Back of Min-Max Algorithm. Alpha-beta pruning: Algorithm, Problems.

Constraint Satisfaction Problems: Definition, Crypt-Arithmetic Problems, Map Coloring, Backtracking.

UNIT - III

Basic Knowledge Representation and Reasoning: Propositional Logic: Basics of logic, truth tables and sentence conversions. First order logic: Difference between Proposition & First order logic. Conjunctive Normal form. Disjunctive Normal Form. Conversion of English sentences into First order logic. Resolution and theorem proving. Problems of Resolution. Forward Chaining: Definition, Example problems. Backward Chaining: Definition, Example problems.

UNIT – IV

Planning Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. **Planning and Acting in the Real World:** Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

UNIT – V

Uncertain knowledge and Learning Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use,

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian

Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees.

Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

Text Books:

1. Artificial Intelligence: A Modern Approach by S. Russell and P. Norvig, Prentice Hall. 2010, third edition.
2. Artificial Intelligence by Elaine Rich, Kevin Knight and Shivashankar B Nair, Tata McGraw Hill.

Reference Books:

1. Introduction to Artificial Intelligence and Expert Systems by Dan W. Patterson, Pearson Education.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.
3. Artificial Intelligence – Patric Henry Winston – Third Edition, Pearson Education

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
CS552PC: DATA SCIENCE LAB

Course Objectives

- Understand the R Programming Language.
- Exposure on Solving data science problems.
- Understand The classification and Regression Model

Course Outcomes

- Illustrate the use of various data structures.
- Analyze and manipulate Data using Pandas
- Creating static, animated, and interactive visualizations using Matplotlib.
- Understand the implementation procedures for the machine learning algorithms.
- Apply appropriate data sets to the Machine Learning algorithms
- Identify and apply Machine Learning algorithms to solve real-world problems.

LIST OF EXPERIMENTS**1) R AS CALCULATOR APPLICATION**

- a) Using with and without R objects on console
- b) Using mathematical functions on console
- c) Write an R script, to create R objects for calculator application and save in a specified location in disk

2) DESCRIPTIVE STATISTICS IN R

- a) Write an R script to find basic descriptive statistics using summary
- b) Write an R script to find subset of dataset by using subset ()

3) READING AND WRITING DIFFERENT TYPES OF DATASETS

- a) Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location.
- b) Reading Excel data sheet in R.
- c) Reading XML dataset in R.

4) VISUALIZATIONS

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

5) CORRELATION AND COVARIANCE

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

6) REGRESSION MODEL

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

7) MULTIPLE REGRESSION MODEL

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

8) REGRESSION MODEL FOR PREDICTION

Apply regression Model techniques to predict the data on above dataset

9) CLASSIFICATION MODEL

- a) Install relevant packages for classification.

- b) Choose a classifier for classification problems.
- c) Evaluate the performance of the classifier.

10) CLUSTERING MODEL

- a) Clustering algorithms for unsupervised classification.
- b) Plot the cluster data using R visualizations.

Suggested Readings:

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

Reference Books:

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

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
V Semester Syllabus
CS556PC: COMPUTER NETWORKS AND WEB TECHNOLOGIES LAB
(Common to IT, CSBS)

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 Outcomes

- Implement data link layer framing 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**COMPUTER NETWORKS Experiments:**

1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. 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.
4. Implement Dijkstra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting technique used in buffers.
10. Wireshark
 - i. Packet Capture Using Wire shark.
 - ii. Starting Wire shark.
 - iii. Viewing Captured Traffic.
 - iv. Analysis and Statistics & Filters.
11. How to run Nmap scan
12. Operating System Detection using Nmap
13. Do the following using NS2 Simulator
 - i. NS2 Simulator-Introduction
 - ii. Simulate to Find the Number of Packets Dropped
 - iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
 - iv. Simulate to Find the Number of Packets Dropped due to Congestion
 - v. Simulate to Compare Data Rate & Throughput.
 - vi. Simulate to Plot Congestion for Different Source/Destination
 - vii. Simulate to Determine the Performance with respect to Transmission of Packets

WEB TECHNOLOGIES Experiments:

1. Write a PHP script to print prime numbers between 1-50.
2. 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.
3. Write a PHP script to merge two arrays and sort them as numbers, in descending order.
4. Write a PHP script that reads data from one file and write into another file.
5. 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
6. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
7. 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.
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. Follow the MVC architecture while doing the website.

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", Pearson International, 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

L	T	P	C
0	0	2	1

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS

B. Tech. V Semester

EN553HS: Finishing School-III

(Advanced Communication Skills Lab)

(Common to CSE, IT, CSB, CSM, and CSD)

Course Objectives:

This Lab focuses on using multi-media instruction for language development to meet the various needs of the students. The objectives of the course are as follows:

- To improve students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- To enable them to communicate their ideas relevantly and coherently in writing.
- To facilitate placement activities for the students.
- To make the students participate in both oral as well as written presentation skills.
- To equip the students to be efficient in Group Discussions, Presentation Skills and Interview Skills.

Course Outcomes:

Students will be able to:

- Acquire English language vocabulary and use it contextually
- Listen and speak effectively in English language
- Develop proficiency in academic reading and writing skills
- Increase possibilities of job prospects in their respective domain
- Communicate confidently in formal and informal contexts

INTRODUCTION:

Advanced English Communication Skills Lab is considered essential as the students need to prepare themselves for their careers which may require them to listen, speak, read and write in English both for their professional and interpersonal communication in the globalized context. This course would enable students to use English effectively and perform the following:

1. Gathering ideas and information to organize ideas relevantly and coherently.
2. Participating in group discussions.
3. Facing interviews.
4. Writing project/research reports/technical reports.
5. Making oral presentations.
6. Writing formal letters.
7. Transferring information from non-verbal to verbal texts and vice-versa.
8. Taking part in social and professional communication.

Unit – I

Inter-personal Communication – Building General, Technical and Business English Vocabulary – Formal meeting–planning and circulating agenda–opening the meeting–during the meeting–closing the meeting–responding appropriately and relevantly – using the right body language-general-technical-business- vocabulary, analogy.

Unit – II

Reading Comprehension: Reading for facts-skimming-scanning-guessing meanings from context, inferring meaning, critical reading, effective online navigation, sample passages from TOEFL/GRE/IELTS.

Unit – III

Writing Skills: Planning for writing, structure and presentation of different types of writing - letter writing/resume writing, email netiquette, project report writing – feasible/business/ periodical/academic reports.

Unit – IV

Presentation Skills: Brief speeches-introduction to a structured talk– oral presentations (individual and group) /PPTs, gambits of presentation skills – use of tag questions, summarising after a brief talk, opening/during/concluding a presentation.

Unit – V

Group Discussion and Interview Skills: Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation - concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and mock interviews.

Text 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.

References:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning Pvt. Ltd. New Delhi.
5. English Vocabulary in Use Series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. Mc Murrey & Joanne Buckley, 2012, Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, AyshaVishwamohan, Tata Mc Graw-Hill 2009.
10. How to Write and Speak Better, Reader's Digest, 2003
11. Cambridge IELTS 16 Academic student's book with answers, 2017
12. TOEFL Reading & Writing Workout, The Princeton Review.
13. GRE Reading Comprehension: Detailed Solutions to 325 questions. Vibrant Publishers, 2017
14. How to prepare for Group Discussions and Interviews by Harimohan Prasad and Rajneesh Prasad, TataMcgrawHill.
15. Keep Talking, Frederick Klippel, Cambridge University Press, South Asian edition (6 May 2010),
16. Objective English, Edgar Thorpe & Showick Thorpe, Pearson; 5th edition (1 August 2013).

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
Scheme of Instruction and Examination B.Tech. V and VI Semester
B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
(Choice Based Credit System)

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	CS602PC	Automata Theory and Compiler Design	3	1	0	30	70	3	4
2	CS606PC	Design and Analysis of Algorithms	3	1	0	30	70	3	4
3	ME631ES	Optimization Techniques	3	1	0	30	70	3	4
4		Professional Elective – III	3	0	0	30	70	3	3
5		Open Elective-I	2	0	0	30	70	3	2
6	MC602ES	Cyber Security	3	0	0	30	70	3	0
7	CS652PC	Algorithms and Compiler Design Lab	0	0	3	30	70	3	1.5
8		Professional Elective-III Lab	0	0	3	30	70	3	1.5
9	ME661ES	Optimization Techniques Lab	0	0	2	30	70	3	1
10	MA654BS	Finishing School – IV (Quantitative Aptitude & Analytical Ability)	0	0	2	30	70	3	1
Total Hours/Marks/Credits			17	3	10	300	700	--	22
11	MC601ESC	Environmental Science (For Lateral Entry Students)	3	0	0	30	70	3	0

L: Lecture **T:** Tutorial **D:** Drawing **P:** Practical

CIE - Continuous Internal Evaluation **SEE** - Semester End Examination

Professional Elective-III

CS618PE	Internet of Things
CS620PE	Machine Learning
CS621PE	Advanced Data Structures
CS622PE	Mobile Application Development

Courses in PE - III and PE - III Lab must be in 1-1 Correspondence

Professional Elective-III Lab

CS671PE	Fundamentals of Internet of Things Lab
CS664PE	Machine Learning Lab
CS665PE	Advanced Data Structures Lab
CS672PE	Fundamentals of Mobile Application Development Lab

L	T	P	C
3	1	0	4

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CS602PC: AUTOMATA THEORY AND COMPILER DESIGN

Course Objectives

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

Course Outcomes

- Able to employ finite state machines for modeling and solving computing problems.
- Able to design context free grammars for formal languages.
- Able to distinguish between decidability and undecidability.
- Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
- 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 ϵ -transitions to NFA without ϵ -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, 3rd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, 2nd Edition, Pearson.
3. Theory of Computer Science –Automata languages and computation, Mishra and Chandrashekar, 2nd Edition, PHI.

Reference Books:

1. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan,Rama R, Pearson.
2. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
3. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
4. Compiler Construction, Kenneth C. Loudon, Thomson. Course Technology.

L	T	P	C
3	1	0	4

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CS606PC: DESIGN AND ANALYSIS OF ALGORITHMS

Prerequisites:

- A course on “Computer Programming and Data Structures”
- A course on “Advanced Data Structures”.

Course Objectives

- Introduces the notations for analysis of the performance of algorithms.
- Introduces the data structure of disjoint sets.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic Programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate
- Describes how to evaluate and compare different algorithms using worst-, average-, and best-case analysis.
- Explains the difference between tractable and intractable problems, and introduces the Problems that are P, NP and NP complete.

Course Outcomes

- Ability to analyze the performance of algorithms.
- Ability to choose appropriate data structures and algorithm design methods for a specified application.
- Ability to understand how the choice of data structures and the algorithm design methods Impact the performance of programs.

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.

Backtracking: General method, applications, n-queen’s problem, sum of subsets problem, graph coloring

Unit – III

Dynamic Programming: General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

Unit – IV

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

Unit – V

Branch and Bound: General method, applications - Traveling salesperson 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.

L	T	P	C
3	1	0	4

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS

VI Semester Syllabus

ME631ES: Optimization Techniques

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, models, general L.P.P formulation, graphical solution, simplex techniques.

UNIT- II

LPP - revised simplex method - duality theory- dual simplex method - sensitivity analysis – parametric programming

UNIT- III

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

UNIT - IV

Scheduling and sequencing - single server and multiple server models -deterministic inventory models - probabilistic inventory control models -geometric Programming

UNIT- V

Competitive models, single and multi-channel problems, sequencing models,dynamic programming, flow in networks, elementary graph theory, game theory simulation

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 and Sons 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

VI Semester Syllabus

CS618PE: Internet of Things

(Professional Elective-II)

(Common to CSE: PE-II; CSBS:PE-III; CSE(AI&ML): P-III)

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 Programming Raspberry Pi with Python.
- To introduce the hardware and working principles of various sensors used for IoT

Course Outcomes: On successful completion of the course, the student will:

- Understand the concepts of Internet of Things.
- Design IoT applications in different domain and be able to analyze their performance.
- Able to know the Language features of Python.
- Able to know about working of Raspberry Pi
- Able to know the working of various Sensors.

Unit I: Introduction to Internet of Things

Introduction, Definition and Characteristics of IoT, Physical Design of IoT- Things in IoT, IoT Protocols, Logical Design of IoT- IoT Functional Blocks, IoT communication models, IoT Communication APIs. **IoT Enabling Technologies** — Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Deployment Templates- IoT Level-1, IoT Level-2, IoT Level-3, IoT Level-4, IoT Level-5, IoT Level-6.

Unit II: Domain Specific IoT

Introduction, Home Automation- Smart Lighting, Smart Appliances, Intrusion Detection, Smoke/Gas Detectors, Smart Cities- Smart Parking, Smart lighting, Smart roads, Structural Health Monitoring, Surveillance, Emergency Response, Environment- Weather Monitoring, Air Pollution Monitoring, Noise Pollution Monitoring, Forest Fire Detection, River Floods Detection, Energy- Smart Grids, Renewable Energy Systems, Prognostics, **Retail-** Inventory Management, Smart Payments, Smart Vending Machines, **Logistics-** Route Generation & Scheduling, Fleet Tracking, Shipment Monitoring, Remote Vehicle Diagnostics, **Agriculture-** Smart Irrigation, Green House Control, **Industry-** Machine

Diagnosis & Prognosis, Indoor Air Quality Monitoring, **Health & Lifestyle-** Health & Fitness Monitoring, Wearable Electronics. **IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT-** Software Defined Networking, Network Function Virtualization

Unit III:

IoT Systems - Logical Design using Python- Introduction, Python Data Types & Data Structures-Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, **Control Flow-** if, for,while, range, break/continue, pass

Functions, Modules, Packages, File Handling, Date/Time Operations, Classes, Python Packages of Interest for IoT- JSON, XML, HTTPLib, URLLib, SMTPLib

Unit IV:

IoT Physical Devices and Endpoints - What is an IoT Device- Basic building blocks of an IoT Device, **Exemplary Device: Raspberry Pi**, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces - serial, SPI, I2C,

Programming Raspberry Pi with Python- Controlling LED with Raspberry Pi, interfacing an LED and Switch with Raspberry Pi, Interfacing a Light Sensor (LDR) with Raspberry Pi.

Unit V:

Buzzer- Function of a Buzzer, Two Kinds of Buzzer, **Relays-** What is a Relay, Its Working, Relay Uses, Why Relay is used in Motor Control, Relay Module.

Sensors: What is an IoT Sensor, **IoT Sensors Types-** Pressure Sensors, Light Sensors, Temperature & Humidity Sensors, Working with Camera Module.

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bagha and Vijay Madiseti, Universities Press, 2015, ISBN: 9788173719547
2. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

REFERENCE BOOKS:

1. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759
2. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895
3. A Hands-On Course in Sensors Using the Arduino and Raspberry Pi (Series in Sensors) 1st Edition, Kindle Edition by Volker Ziemann 2018.

L	T	P	C
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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CS620PE: MACHINE LEARNING (Professional Elective – III)

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

- Understand the concepts of computational intelligence like machine learning
- Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
- Understand the Neural Networks and its usage in machine learning application.

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, Gibbs 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, invertingre 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.

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CS621PE: 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 and digital search structures

Course Outcomes

- Ability to select the data structures that efficiently model the information in a problem
- Ability to understand how the choice of data structures impact the performance of programs
- Design programs using a variety of data structures, including hash tables, search structures and digital search structures.

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, SanguthevarRajasekaran, Universities Press.

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CS622PE: MOBILE APPLICATION DEVELOPMENT
(Professional Elective – III)
[Common to CSBS, CSE (AI & ML), CSE (Data Science)]

Prerequisites

- Acquaintance with JAVA programming.
- A Course on DBMS.

Course Objectives

The student should be able to:

- To demonstrate their understanding of the fundamentals of Android operating systems.
- To improve their skills of using Android software development tools.
- To demonstrate their ability to develop software with reasonable complexity on mobile platform.
- To demonstrate their ability to deploy software to mobile devices.
- To demonstrate their ability to debug programs running on mobile devices.

Course Outcomes

Upon Completion of the course, the students will be able to

- Student understands the working of Android OS Practically.
- Student will be able to develop Android user interfaces
- Student will be able to develop, deploy and maintain the Android Applications.

UNIT - I

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools

Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus, etc., Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT - II

Android User Interface: Measurements – Device and pixel density independent measuring UNIT - s Layouts – Linear, Relative, Grid and Table Layouts

User Interface (UI) Components – Editable and non-editable Text-Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers

Event Handling – Handling clicks or changes of various UI components

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT - III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity

Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT - IV

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference.

UNIT - V

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

Suggested Readings:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012.
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013.

Reference Book:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

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3	0	0	0

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS

VI-Semester

MC602ES: CYBER SECURITY

(Common CSE, IT, CSBS, CSE(AI & ML), CSE(Data Science))

Prerequisites: NIL

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 various cyber-attacks and cybercrimes.
- Knowledge about cyberlaws and cyber forensics.
- Summarize cyber crimes in mobile and wireless devices, how to protect them
- Knowledge about IPR issues in cyber space and cyber terrorism.

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, IP spoofing, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace.

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.

UNIT- IV

Cyber Security: Organizational Implications: Introduction cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the 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.

TEXT BOOKS:

1. Nina God bole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley, India 2012.
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. Mark F. Grady, Francesco Parisi, “ The Law and Economics of Cyber security”, Cambridge University Press, 2006.
2. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press, 2016.
3. 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
CS652PC: 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

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

LIST OF EXPERIMENTS (Algorithms):

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

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, Loudon, Thomson.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CS671PE: Fundamentals of Internet of Things Lab(PE – III Lab)
(CSBS)

Course Objectives:

- Will be able to write and test on a Raspberry Pi, but not limited this only.
- Will be able to do some Python programs on Raspberry

Course Outcomes: On successful completion of the course, the student will:

- Able to understand the applications areas of IOT.
- Able to realize the revolution of Internet and Mobile devices, cloud and Sensors networks.
- Working with Raspberry Pi.

List of Experiments:

- 1 Start Raspberry Pi and try various Linux commands in command terminal window:*ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.*
2. Run some python programs on Pi like:
 - Read your name and print Hello message with name
 - Read two numbers and print their sum, difference, product and division. Word and character count of a given string
 - Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input
 - Print a name 'n' times, where name and n are read from standard input, using for and while loops.
 - Handle Divided by Zero Exception.
 - Print current time for 10 times with an interval of 10seconds. Read a file line by line and print the word count of each line.
3. Light an LED through Python program
4. Get input from two switches and switch on corresponding LEDs
5. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
6. Flash an LED based on cron output (acts as an alarm)
7. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.
8. a. A Python program to check the presence of light using **LDR Sensor Module** on Pi
 b. A Python program to measure the intensity of light using **LDR Sensor Module** on Pi

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. A Hands-On Course in Sensors Using the Arduino and Raspberry Pi (Series in Sensors) **1st Edition, Kindle Edition** by Volker Ziemann.

REFERENCE BOOKS:

1. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759
2. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895 N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
CS664PE: MACHINE LEARNING LAB (PE – III Lab)

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

- Compare Machine Learning algorithms based on their advantages and limitations and use the best one according to situation
- Interpret and understand modern notions in data analysis-oriented computing
- Apply Conditional Probability using Bayes Theorem
- Evaluate Decision tree algorithms using real world data
- 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 enjoysports .CSV file)
2. Implement the decision tree based ID3 algorithm.
3. Implement single layer perceptron.
4. Implement multilayer perceptron with backpropagation.
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
CS665PE: 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

- Ability to select the data structures that efficiently model the information in a problem.
- Ability to assess efficiency trade-offs among different data structure implementations or combinations.
- Implement and know the application of algorithms for sorting and pattern matching.
- Design programs using a variety of data structures, including hash tables, binary and general tree 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 Leftist 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, 2nd Edition, Universities Press.
2. Data Structures Using C – A.S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson education.
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
CS672PE: FUNDAMENTALS OF MOBILE APPLICATION DEVELOPMENT LAB
(PE – III Lab)
(CSBS)

Prerequisites**Course Objectives**

The student should be able to:

- To learn how to develop Applications in android environment.
- To learn how to develop user interface applications.
- To learn how to develop URL related applications.

Course Outcomes

Upon Completion of the course, the students will be able to

- Student understands the working of Android OS Practically.
- Student will be able to develop user interfaces.
- Student will be able to develop, deploy and maintain the Android Applications

List of Experiments

1. Create an Android application that shows Hello + name of the user and run it on an emulator.
 - (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use
 - (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a “Back” button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.
7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.
9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.
10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.
11. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.
12. Create an application that shows the given URL (from a text field) in a browser.

TEXT BOOKS:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

REFERENCE BOOK:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

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

ME661ES: 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 through 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 such partition 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 the array should be minimum non-negative (as close to zero as possible). Return the minimum number of elements whose sign needs to be flipped such that the resultant sum is minimum non-negative. Note that the sum of all the array elements 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 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 is maximum 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. **QUEUEING PROBLEM (Use TORA)**
A supermarket has two girls ringing up sales at the counters. If the service time for each customer is exponential with mean 4 minutes, and if people arrive in a Poisson fashion at the 10/hour

8. SEQUENCINGPROBLEM(UseTORA)

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

Job	1	2	3	4	5
MachineA	10	2	18	6	20
MachineB	4	12	14	16	8

Determine a sequence for the five jobs that will minimize the total elapsed time. Also compute idle times for each of the machines.

9. GAMETHEORY(Use TORA)

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

Player-A	Player-B				
	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. ASSIGNMENTPROBLEM (UseTORA)

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.

		WareHouses				
		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. DYNAMICPROGRAMMINGPROBLEM

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. INVENTORYPROBLEM(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 occur. He has estimated that the annual cost of back ordering will be 25% of the value of inventory.

- a. What should be the optimum no. of units he should buy in 1 lot?
- b. What quantity of the product should be allowed to be back ordered?
- c. What would be the max quantity of inventory at any time of year?

Would you recommend allowing back ordering? If so, what would be the annual cost saving by adopting the policy of back ordering?

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
B.Tech. VI Semester
MA654BS: Finishing School-IV
(Quantitative Aptitude & Analytical Ability)
(Common to CSE, IT, CSBS, CSM & CSD)

Course Objectives:

This is a foundation course and aims to enhance employability skills in students.

1. Students will be introduced to higher order thinking skills and problem-solving on the following areas - Arithmetic ability, Numerical ability and General reasoning.
2. Students will be trained to work systematically with speed and accuracy while solving problems.

Course Outcomes:

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

1. Solve questions on the above-mentioned areas using shortcut and smart methods
2. Understand the fundamental concepts of Aptitude skills
3. Perform calculations with speed and accuracy

UNIT 1: QUANTITATIVE APTITUDE - NUMERICAL ABILITY

- Number system
- Divisibility Rules
- Square root
- Cube root
- Problems on numbers
- LCM and HCF

UNIT 2: QUANTITATIVE APTITUDE- ARITHMETIC ABILITY-I

- Percentage
- Ratio proportions
- Averages
- Profit, loss and discounts
- Simple and Compound interest

UNIT3: QUANTITATIVE APTITUDE- ARITHMETIC ABILITY-II

- Pipes and Cisterns
- Ages
- Time- Work-Speed-Distance
- Clocks & Calendars
- Venn diagrams
- Tables and graphs

UNIT 4: REASONING ABILITY – GENERAL REASONING-I

- Coding decoding
- Directions
- Series completions - Letter, Number & Element Series
- Seating arrangements
- Symbols and Notations

UNIT 5: REASONING ABILITY- GENERAL REASONING -II

- Analogies
 - Alphabet Analogy
 - Numerical Analogy
- Classification
 - Alphabet Classification
 - Word Classification
 - Miscellaneous Classification
- Alphabet test
 - Arranging words in Alphabetical Order
 - Problems based on Letter-Word
 - Problems based on Alphabetical Quibble
- Blood Relations

REFERENCES:

1. R.S. Aggarwal - Quantitative Aptitude for Competitive Examinations.
2. Arun Sharma - Quantitative Aptitude for CAT.
3. Arihant Publications - Fast Track Objective Arithmetic.
4. Sarvesh K.-Quantitative aptitude
5. A New Approach to Reasoning Verbal & Non-Verbal, Book by B.S. Sijwalii and Indu Sijwali
6. A Modern Approach to Logical Reasoning, Book by Agarwala Vikas and R.S. Aggarwal

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VI Semester Syllabus
MC601ESC: Environmental Science
(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 :Natural Resources

Classification - Renewable and Non-renewable resources.

Forest Resources - Uses, deforestation- causes, effects and preventive measures.

Water Resources - Uses and over utilization of ground water, rain water harvesting, dams - benefits and problems. Causes, effects and management of floods and drought.

Mineral Resources - Uses and Impacts of mining.

Energy Resources - Growing energy needs, renewable and non-renewable energy resources, use of alternate energy resources.

Unit – II :Ecosystem and Biodiversity

Ecosystem: Concept of ecosystem - Structure and functions of ecosystem. Food

chain, food web and ecological pyramids - significance. Primary and secondary production - Energy flow models: universal and single channel. Biogeochemical Cycles: Carbon cycle and Nitrogen cycle.

Biodiversity: Definition, Levels of biodiversity, Values of biodiversity, Hotspots of biodiversity, Threats to biodiversity, Conservation of biodiversity: In-Situ and Ex-Situ conservation methods.

Unit – III : Environmental Pollution

Pollution - Definition and classification.

Air pollution: Definition, sources, causes, effects and control measures. Ambient air quality parameters, Case Study.

Water pollution: Definition, sources, causes, effects and control measures. Waste water treatment. Case study (Namami Ganga Project) Soil pollution: Sources, Land degradation - Soil erosion – effects and control measures. Impacts of modern agriculture on soil. Biomagnification and Bioaccumulation (Minamata disease).

Noise pollution: Sources, effects and control measures.

Solid Waste: E-Waste and Municipal solid waste management.

Unit – IV: Global Environmental Issues and Global Efforts

Global warming: Greenhouse effect - definition, sources and effects of greenhouse gases. Ozone layer depletion -Importance of ozone layer, Ozone depleting substances - sources and effects. Acid rain - causes and effects. Climate change - National Action Plan on Climate Change (NAPCC) – Government of India Initiatives. International conventions/protocols: The Earth summit, Kyoto Protocol and Montreal Protocol. Carbon credits - Emission trading, Green Chemistry Principles. Biodiesel-concept - transesterification and advantages.

Unit – V : Environmental Acts, EIA & Sustainable Development

Environmental Protection Act - Legal aspects: Air (Prevention and control of pollution) Act 1981, Water (Prevention and control of pollution) Act -1974, Wildlife (Protection) Act – 1972, Biodiversity Act - 2002. Environmental Impact Assessment (EIA) - Concept, structure and flow chart of EIA. Concept of sustainable development - Environmental education, Concept of green building, Ecological foot print, Low carbon life style, Life cycle assessment (LCA) and Clean development mechanism.

Project Work : Related to current environmental issues.

Suggested Readings :

1. ErachBharucha, Textbook of Environmental Studies for Undergraduate Courses, University Grants Commission, Universities Press, 3rd Edition.
2. Kaushik A., Kaushik C.P., Text Book of Environmental Studies, New Age International Publishers, 4th Edition.

Reference Books:

1. Anji Reddy M, Textbook of Environmental Sciences and Technology, BS

Publication.

2. Rajagopalan R., Environmental Studies, Oxford University Press, 3rd Edition.
3. Raghavan Nambiar K., Text Book of Environmental Studies, Scitech Publications, 2nd Edition.

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
Scheme of Instruction and Examination B.Tech. VII and VIII Semester
B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
(Choice Based Credit System)
For the batch to be admitted in the academic year 2021-22

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	MS701HS	Marketing Management and Research	3	0	0	30	70	3	3
2	CS704PC	Design Thinking	3	0	0	30	70	3	3
3		Professional Elective –IV	3	0	0	30	70	3	3
4		Professional Elective –V	3	0	0	30	70	3	3
5		Open Elective – II	2	0	0	30	70	3	2
6	CS752PC	Product Design Lab	0	0	2	30	70	3	1
7	CS755PC	Industry Oriented Mini Project/ Summer Internship	0	0	4	-	100	-	2
8	CS756PC	Seminar	0	0	2	100	-	-	1
9	CS758PC	Project Stage – I	0	0	6	30	70	-	3
Total Hours/Marks/Credits			14	0	14	310	590		21

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	MS801HS	Human Resource Management	3	0	0	30	70	3	3
2		Professional Elective – VI	3	0	0	30	70	3	3
3		Open Elective – III	2	0	0	30	70	3	2
4	CS852PC	Project Stage – II	0	0	16	30	70	-	8
Total Hours/Marks/Credits			8	0	16	120	280		16

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

***Note:** Industry Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit a report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

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

MC –Satisfactory/Unsatisfactory

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
Scheme of Instruction and Examination B.Tech. VII and VIII Semester
B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
(Choice Based Credit System)

VII SEMESTER

S.No	Course Code	Course Title	Instruction			Examination		Credits	
			Hours Per Week			Max. Marks			Duration of SEE inHours
			L	T	P/D	CIE	SEE		
1	MS701HS	Marketing Management and Research	3	0	0	30	70	3	3
2	CS704PC	Design Thinking	3	0	0	30	70	3	3
3		Professional Elective –IV	3	0	0	30	70	3	3
4		Professional Elective –V	3	0	0	30	70	3	3
5		Open Elective – II	2	0	0	30	70	3	2
6	CS752PC	Product Design Lab	0	0	2	30	70	3	1
7	CS755PC	Industry Oriented Mini Project/ Summer Internship	0	0	4	-	100	-	2
8	CS756PC	Seminar	0	0	2	100	-	-	1
9	CS758PC	Project Stage – I	0	0	6	30	70	-	3
Total Hours/Marks/Credits			14	0	14	310	590		21

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

Professional Elective-IV

CS711PE	Natural Language Processing
CS718PE	Distributed Systems
CS719PE	Big Data Analytics
CS720PE	DevOps
MS711PE	Logistics & Supply Chain Management

Professional Elective-V

CS726PE	Digital Payment Systems
CS727PE	Image Processing
CS728PE	Blockchain Technology
CS729PE	Service Oriented Architectures
MS712PE	Financial Modeling

L	T	P	C
3	0	0	3

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
B.Tech. VII Semester
MS701HS: Marketing Management and Research
(CSBS)

Course Objectives: The objectives of the course are:

- To explore the basic concepts of marketing management.
- To create an awareness on various marketing opportunities and develop marketing mix elements.
- To gain the knowledge on market and develop customer driven segmentation, targeting and positioning strategies.
- To develop understanding of the basic framework of marketing research process.
- To learn scaling, data collection, analysis, interpretation, and report writing techniques.

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

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

UNIT – I:

Introduction to Marketing Management:

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

UNIT – II:

Marketing Mix:

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:

Segmentation, Targeting and Positioning

Designing a Customer Driven Strategy: Market segmentation - STP Process - segmentation of consumer market, business market, requirement for effective segmentation, market targeting – evaluating market segmentation, selecting target market segmentation, positioning – Positioning and repositioning positioning maps, product positioning strategies.

UNIT – IV:

Problem Formulation and Research Design

Marketing Research: Introduction, Management uses of marketing research, Problem Formulation & 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 & Scaling, Data Analysis & Interpretation and Report Writing

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, Principles of Marketing, 17e, Pearson Education, 2018.
2. Malhotra, Naresh K. Marketing research: an applied orientation 6th ed., Pearson, 2010.
3. Parasuraman, and Dhruv. Marketing Research. 2nd edition, Houghton Mifflin, 2006.

REFERENCE BOOKS:

1. Lamb, Hair, Sharma, Mc Daniel, Principles of Marketing, A South Asian Perspective Cengage Learning, 2016.
2. Arun Kumar & N. Meenakshi, Marketing Management, Vikas, 2012
3. Green, Paul E. Tull, Donald S., Research for marketing decisions 5e., Prentice-Hall, 1998.

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
CS704PC: DESIGN THINKING

Course Objectives

- To inculcate core design principles and applied creativity to develop innovative strategies that better connect engineers with their end users
- To build mindset leading to flow of creative ideas, validating those ideas and prioritizing the best ones
- To incorporate tools that designers need to take a design project from inspiration and insights to ideation and implementation
- To instill full scope of organizational innovation and strategy through knowledge, insight and analytical skills

Course Outcomes

- Use design thinking and hypothesis-driven innovation processes to develop viable solutions to user challenges
- Use multiple brainstorming techniques to find innovative solutions
- Develop and test a business model or business case to support the viability of the solution
- Prototype a solution to a user challenge
- Investigate the cultural, emotional, technological and business factors relevant to developing new product or service design concept.

Unit – I

Revisiting Design Thinking: Creative thinking as basis of innovation; Empathy process for deep understanding of challenge with practical ingenuity; Making sense of observations and insights; Defining a point of view and context Design thinking skills for Problem Discovery, Definition, and Ideation – Identifying problems in daily lives and in the world at large, Understanding user and customer perspectives, Thinking from the problem before thinking of a solution

Unit – II

Ideation Process: Clear Articulation of problem statement with focus on latent needs; Brainstorming potential solutions; Ideation methods with case-study based approach to using Systematic Inventive Thinking (SIT) Methods such as Addition, Subtraction, Multiplication, Division and Task Unification Strategic Innovation for competition in future: Linear Innovation vs. non-linear innovation, Understanding and identifying weak signals, 3-box thinking, 3-Box framework and Box-3 ideation

Unit – III

Designing Customer Experience: Understanding Innovation through Design Thinking; Enhancing Customer Experience; Service Design and Development Process and Case Studies; Service Experience Cycle and Case Studies

Unit – IV

Sustainable Design Approaches: Concern for Environment and Sustainability in Design, Case Studies to understand good Design For Environment (DFE) Decisions; Design Considerations in the five stages of the Product Life Cycle.

Unit – V

Integrative Engineering Design Solutions: Identifying and resolving issues with working in diverse teams, Modularising, prototype building by different engineering disciplines within the team, validated learning with accessible metrics, Capstone Project (Interdisciplinary)

Applying Design Thinking Principles and Methods for Ideation and Prototyping, Testing Solution, Refining Solution, and Taking the Solution to the Users

Suggested Readings:

1. 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, VijayKumar, John Wiley & Sons, ISBN: 978-1118083468, 2012
2. Living with Complexity, Donald A Norman, MIT Press, ISBN: 978-0262528948, 2016
3. Design Thinking for Entrepreneurs and Small Businesses: Putting the Power of Design to Work, Beverly Rudkin Ingle, A Press, ISBN: 978-1430261810, 2013.

Reference Books:

1. Emotionally Durable Design: Objects, Experiences and Empathy, Jonathan Chapman, 2nd Edition, Routledge, ISBN: 978-0415732161, 2015
2. Innovation Design: How Any Organization Can Leverage Design Thinking to Produce Change, Drive New Ideas, and Deliver Meaningful Solutions, Thomas Lockwood, Edgar Papke, New Page Books, ISBN: 978-1632651167, 2017
3. Design Thinking Business Analysis: Business Concept Mapping Applied, Thomas Frisendal, Springer, ISBN: 978-3642434822, 2012
4. Chapter 1: A Simple Framework for Leading Innovation, The Three Box Solution, HBR Press, 2016
5. Design a Better Business: New Tools, Skills and Mindset for Strategy and Innovation, Patrick Van Der Pijl, Justin Lokitz, Lisa Kay Solomon, Erik van der Pluijm, Maarten van Lieshout, Wiley, ISBN: 978-8126565085, 2016

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
CS711PE: NATURAL LANGUAGE PROCESSING
(Professional Elective-IV)
(Common to CSE:PE-III,
CSBS: PE-IV & CSE (Data Science): PE-IV)

Prerequisites: Data structures, finite automata and probability theory

Course Objectives:

Introduce 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,

Able to design different language modeling Techniques.

UNIT - I

Finding the Structure of Words: Words and Their Components, Issues and Challenges,

Morphological Models. POS tagging, Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches.

UNIT - II

Syntax Analysis: Parsing Natural Language, A Data-Driven Approach to Syntax,

Representation of Syntactic Structure, Parsing Algorithms, Treebanks, Models for Ambiguity Resolution in Parsing, Multilingual Issues.

UNIT - III

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

UNIT - IV

Predicate - Argument Structure, Meaning Representation Systems, Software.

UNIT - V

Discourse Processing: Cohesion, Reference Resolution, Discourse Cohesion and Structure
Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modeling

TEXT BOOKS:

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

REFERENCE BOOK:

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

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
CS718PE: DISTRIBUTED SYSTEMS
(Professional Elective-IV)
(Common to CSE & CSBS))

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

- Ability to understand Transactions and Concurrency control.
- Ability to understand Security issues.
- Understanding Distributed shared memory.
- Ability to design distributed systems for basic level applications.
- To understand different Fault tolerant mechanisms.

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, Interprocess 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, Consistency models.

TEXT BOOKS:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, 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, Pearson Education.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani and Mukesh Singhal, Cambridge, rp 2010.
3. Distributed Computing Pearls, Gadi Taubenfeld, Michel Raynal, Springer 2018

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS

VII Semester Syllabus

CS719PE: 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 Analytics principles and techniques.
- This course is also designed to give an exposure of the frontiers of Big data Analytics

Course Outcomes

- Ability to explain the foundations, definitions, and challenges of Big Data and various Analytical tools.
- Ability to program using HADOOP and Map reduce, NOSQL
- 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 MapReduce - 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 Advanced Analytics, Bill Franks, 1st Edition, Wiley and SAS Business Series, 2012.

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
CS720PE: DEVOPS (Professional Elective – IV)

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

- Identify components of Devops environment
- Describe Software development models and architectures of DevOps
- Apply different project management, integration, testing and code deployment tool
- Investigate different DevOps Software development models
- 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-

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
B.Tech. VII Semester
MS711PE: Logistics and Supply Chain Management
(Professional Elective–IV)
(CSBS)

Course Objectives: The Objectives of the Course are:

- To developing an understanding of the key concepts applied in Logistics and Supply Chain Management.
- To provide insights into the role of Logistics and Supply Chain Management in an Organization.
- To make them focus on Warehousing and Transportation techniques,
- To gain knowledge in strategic issues related to supply chain management.
- 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:

- Understand the history and various concepts of Logistics and Supply Chain Management.
- Classify and compare various processes and Technology used in Logistics and Supply Chain Management.
- Analyze and differentiate various strategies in Transportation and Warehousing in Logistics and Supply Chain Management.
- Analyze various Strategic issues and manufacturing techniques in relation to Logistics and supply chain management.
- 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

Logistics Management, Inbound, Internal and Outbound Logistics in SCM, Logistics Organization, Development of Integrated Logistics Strategy, 3PL, 4PL, Reverse Logistics. Role and Importance of Inventory in SC, 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, Modes of Transport, Fleet Management, Multi model transport, Containerization, 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 Issues and Problems, Types, Methods, Process, Lean Manufacturing ,Agile Manufacturing. Laws related to Transport in India.

Unit-V:

Supply Chain Interface

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

Text Books:

1. Chandrasekaran. N, "Supply Chain Management Process, System and Practice", 2nd edition, OxfordUniversityPress,2012.
2. Sunil Chopra, Peter Meindland D.V.Karla,"Supply Chain Management, Strategy, Planning and Operations", 6th edition, Pearson education,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. Judy Dickens, "Supply Chain Planning and Execution", 1stedition,Willford Press,2019.
3. Richard B Chase, Ravi Shankar and F Robert Jacobs, "Operations and Supply Chain Management", 15thedition, Mc Graw HillEducation,2018.

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS

VII Semester Syllabus

CS726PE: 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

- Understand the shifts that are occurring with regard to digital payments.
- Acquire a comprehensive understanding of different tasks associated in usage of digitalpayment systems.
- Understand risks involved in e-payments and their counter-measures to provide securetransactions.
- Understand and analyze chip card technology for digital payment systems.

Unit – I

Introduction, Magnetic stripe debit and Credit cards, Chip Migration with EMV™, Remote debit and credit with EMV™

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™ data elements, EMV™ file system, EMV™ 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™ certification chain, Issuing EMV™ public key certificates, Verifying EMV™ 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, ComputerSecurity 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 DigitalExperience, Routledge
3. David A. Montague, Essentials of Online payment Security and Fraud Prevention, Wiley

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS

VII Semester Syllabus

CS727PE: 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 of Digital 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 Processing concepts.
- The topics include image acquisition sampling and quantization; pre-processing; enhancement; restoration; segmentation; and compression.

Course Outcomes

- The basic concepts of two-dimensional signal acquisition, sampling, and quantization.
- Filtering techniques.
- 2D transformation techniques.
- Image enhancement, segmentation, restoration and compression techniques.

Unit – I

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

Unit – II

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

Unit – III

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

Unit – IV

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

Unit – V

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

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 MATLAB: Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins: Pearson Education India, 2004.
3. Digital Image Processing: William K. Pratt, John Wiley, 3rd Edition, 2004.

L	T	P	C
3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
CS728PE: BLOCKCHAIN TECHNOLOGY (Professional Elective – V)
(COMMON TO CSBS, CSE (AI&ML))

Prerequisites:

- Knowledge insecurity and applied cryptography.
- Knowledge in distributed databases

Course Objectives

- | |
|--|
| <ul style="list-style-type: none"> • To Introduce block chain technology and Crypto currency. |
|--|

Course Outcomes

Students would be able to

- | |
|---|
| <ul style="list-style-type: none"> • Learn about research advances related to one of the most popular technological areas today. • Understand Extensibility of Block chain concepts. • Understand and Analyze Blockchain Science. • Understand Technical challenges, Business model challenges. |
|---|

UNIT-I

Introduction: Block chain or distributed trust, Protocol, Currency, Cryptocurrency, How a Cryptocurrency works, Crowd funding.

UNIT-II

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

UNIT-III

Block chain Science: Grid coin, Folding coin, Blockchain Genomics, Bitcoin MOOCs.

UNIT-IV

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

UNIT-V

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

Suggested Reading:

1. Melanie Swan, Block chain Blueprint for Economy, O'reilly.

Reference Books:

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

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS

VII Semester Syllabus

CS729PE: SERVICE ORIENTED ARCHITECTURES (Professional Elective – V)

Course Objectives

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

Course Outcomes

- Understand case studies of service-oriented architectures.
- Solving problems in service orientation.
- Understanding principles of SOA.
- Knowledge on characteristics of SOA.
- 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-Oriented: Introduction to Service-Oriented, Problems Solved by Service-Oriented, Effects of Service-Oriented on the Enterprise, Goals and Benefits of Service-Oriented Computing, Four Pillars of Service-Oriented

Unit – III

Service-Oriented Principles: A profile for the Standardized Service Contract principle, A profile for the 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-Oriented 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-Oriented, Identify Service Composition Candidates, Analyze Processing Requirements, Define Utility Service Candidates, Define Microservice Candidates, Apply Service-Oriented, 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

VII Semester Syllabus

MS712PE: Financial Modeling

(Professional Elective – V)

(CSBS)

Course Objectives: The objectives of the course are:

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

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

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

UNIT – I:

Financial Statement Analysis, Cash flows and Valuation Modelling: Income statement Analysis, Balance sheet Analysis, Cash flow Statement Analysis and Forecasting, Terminal value Calculations the use of fade periods, the return on capital, 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-Collateralized 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 excell functions in VBA, Typesand 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 Modeling Using Excel and VBA, 2e, Wiley, 2009

Reference Books:

1. Thomas S.Y. Ho and Sang Bin Lee: The Oxford guide to Financial Modeling - Application for capital markets, Corporate finance, Risk Management and financial Institutions, Oxford University Press, 2004.
2. Simon Benninga - Financial Modeling 4th edition, MIT Press, London, 2014.
3. Paul Pignataro, Financial Modeling and Valuation: A Practical Guide to Investment Banking and Private Equity, Wiley, 2013

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VII Semester Syllabus
CS752PC: PRODUCT DESIGN LAB

Prerequisite: Design Thinking

Course Objectives

- The focus of Product Design and Development is integration of the marketing, design, and manufacturing functions of the firm in creating a new product.

Course Outcomes

- Understand a set of tools and methods for product design and development.
- Knowledge for enhancing our abilities to create a new product.
- Awareness of the role of multiple functions in creating a new product (e.g. marketing, finance, industrial design, engineering, production).

LIST OF EXPERIMENTS:

- Problem Statement (Clearly mention the problem your group would like to solve)
 - Mission Statement (Why is it important to solve this problem? Who will be the beneficiaries? What is the market opportunity?)
 - Value Proposition (Clearly state the redefined problem with specific issues the team would like to solve)
- Assumptions (What are the current/existing considerations/limitations regarding the problem your team would like to address?)
 - Stakeholders (List all the stakeholder groups that can influence or can be influenced by a change. Which stakeholder group(s) will be benefitted? Which stakeholder group(s) has your team interacted with? – Identify which user group you would like to target the solution - Mainstream, Extreme or Latent users)
- Empathy Tool Used (What/How/Why, Empathy Map, AEIOU method, Beginner's mindset, Story/Share capture, etc.)
- Data Collection (Research, Questionnaires, Interviews, Surveys, Stakeholder groups, Statistics, etc.)
- Insights (Document all points from data collection stage to form insights about the problem)
- Ideation Method Used (Mind Map, Brainstorming, SIT method, SCAMPER, Three-Box Thinking)

Suggested Readings:

- Ulrich, Karl, and Steven Eppinger. Product Design and Development. 3rd ed. New York, NY: McGraw-Hill, 2004. ISBN: 9780072471465.

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
Scheme of Instruction and Examination B.Tech. VII and VIII Semester
B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
(Choice Based Credit System)

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	MS801HS	Human Resource Management	3	0	0	30	70	3	3
2		Professional Elective – VI	3	0	0	30	70	3	3
3		Open Elective – III	2	0	0	30	70	3	2
4	CS852PC	Project Stage – II	0	0	16	30	70	-	8
Total Hours/Marks/Credits			8	0	16	120	280		16

L: Lecture **T:** Tutorial **D:** Drawing **P:** Practical

CIE - Continuous Internal Evaluation **SEE** - Semester End Examination

Professional Elective - VI

MS811PE	Innovation IP Management and Entrepreneurship
CS819PE	Decision Support Systems
CS820PE	Social Media Analytics
CS821PE	Deep Learning
CS822PE	Data Visualisation Techniques

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3	0	0	3

B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VIII Semester Syllabus
MS801HS: Human Resource Management
(CSBS)

Course Objectives: The objectives of the Course are:

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

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

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

UNIT - I:

Introduction of HRM:

Introduction to HRM –(Importance of HRM)– HR Role and responsibilities, New Approaches to Organizing HR – Globalization & Competition Trends – Technological Trends – Trends in Nature of Work – Workforce and Demographic Trends – Economic Challenges – High Performance Work System’s – Labor Legislation in India – 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 – Recruitment on Diverse WorkForce – 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 & Designing the 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 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 & Minimum Wages Act.

UNIT - V:

Employee Relations

Employee Relations – Labor Movement – Collective Bargaining Process – Grievances – Grievances handling procedure – Employee Separation, Inter-State Migrant Workers Act 1979, Sexual harassment, Section 354(A).

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, Manas Ranjan Tripathy, Human Resource Management, Cengage Learning 2016.

Reference Books:

1. Sharon Pande and Swapnalekha Basak, Human Resource Management, Text and Cases, 2e, Vikas Publishing, 2015.
2. Uday Kumar Haldar, Juthika Sarkar, Human Resource Management, Oxford University Press 2013.
3. Arun Monappa, Ranjeet Nambudiri, Patturaja Selvaraj, “Industrial Relations and Labour Laws”, McGraw-Hill, 2015.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS

VIII Semester Syllabus

MS811PE: Innovation IP Management and Entrepreneurship

(Professional Elective–VI)

(CSBS)

Course Objectives: The objectives of the course are:

- To know the importance of entrepreneurship and develop entrepreneurship skills.
- To learn formulation of Business plan and also about different sources of finance facilities available for start-ups.
- To disseminate knowledge on importance of innovation, creativity and idea generation.
- To learn different types of intellectual property and importance of protecting IPR.
- To emphasize the role MSME sector and women entrepreneurship.

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

- Comprehend the requirements and responsibilities of entrepreneurs in growth of economy.
- Formulate a business plan based on a business idea.
- Understand the necessity of innovation in current business world.
- Describe the fundamentals of intellectual property rights and legislation
- Analyze the problems of MSME and strategies to develop women entrepreneurship

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 start-ups, 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 & 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, second edition, WIPO publication No. 888, Switzerland

REFERENCE BOOKS:

1. Berman, Ideas to Assets, Wiley publications
2. Richard Dorf & Thomas Byers, Technology ventures from idea to enterprise,2nd edition.
3. BosworthD. &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
CS819PE: 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

- Understand the decision-making process.
- Perform decision analysis and modelling.
- Develop a DSS and Analyze the role of knowledge management in DSS.
- Understand knowledge-based system and knowledge engineering.
- 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, 8th edition, Prentice Hall, 2007
2. Burstein F., Holsapple C.W. (eds.) Handbook on Decision Support Systems, Springer, 2008

Reference Books:

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

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VIII Semester Syllabus
CS820PE: SOCIAL MEDIA ANALYTICS (Professional Elective – VI)

Course Objectives

- Knowledge on social media and its analytics

Course Outcomes

- Understanding characteristics and types of social media
- Knowledge on layers of social media analytics
- Apply text analysis tools on social media data
- Understand the significance of action analytics
- Detect viral topics on social media (YouTube).

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™, Dreamtech Press, 2015 Edition.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VIII Semester Syllabus
CS821PE: DEEP LEARNING (Professional Elective – VI)

Course Objectives

- To understand complexity of Deep Learning algorithms and their limitations
- To be capable of performing experiments in Deep Learning using real-world data.

Course Outcomes

- Implement deep learning algorithms, understand neural networks and traverse the layers of data
- Learn topics such as convolutional neural networks, recurrent neural networks, training deep networks and high-level interfaces
- Understand applications of Deep Learning to Computer Vision
- Understand and analyze Applications of Deep Learning to NLP.

Unit – I

Introduction: Feed forward Neural networks, Gradient descent and the back-propagation algorithm, Unit saturation, the vanishing gradient problem, and ways to mitigate it. ReLU Heuristics for avoiding bad local minima, Heuristics for faster training, Nestors accelerated gradient descent, Regularization, Dropout

Unit – II

Convolutional Neural Networks: Architectures, convolution/pooling layers, Recurrent Neural Networks: LSTM, GRU, Encoder Decoder architectures. Deep Unsupervised Learning: Auto encoders, Variational Auto-encoders, Adversarial Generative Networks, Auto-encoder and DBM Attention and memory models, Dynamic Memory Models

Unit – III

Applications of Deep Learning to Computer Vision: Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models, Attention Models for computer vision tasks

Unit – IV

Applications of Deep Learning to NLP: Introduction to NLP and Vector Space Model of Semantics, Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of-Words model (CBOW), Glove, Evaluations and Applications in word similarity

Unit – V

Analogy reasoning: Named Entity Recognition, Opinion Mining using Recurrent Neural Networks: Parsing and Sentiment Analysis using Recursive Neural Networks: Sentence Classification using Convolutional Neural Networks, Dialogue Generation with LSTMs.

Suggested Readings:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.

Reference Books:

1. Bishop, C.M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G., H., and Van Loan, C. F., Matrix Computations, JHU Press, 2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

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B.Tech. in COMPUTER SCIENCE & BUSINESS SYSTEMS
VIII Semester Syllabus
CS822PE: DATA VISUALIZATION TECHNIQUES (Professional Elective – VI)

Course Objectives

- To understand various data visualization techniques.

Course Outcomes

- Visualize the objects in different dimensions.
- Design and process the data for Virtualization.
- Apply the visualization techniques in physical sciences, computer science, applied mathematics and medical science.
- 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, Morgan Kaufmann Publishers, 2004.

Reference Books:

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