SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(AUTONOMOUS)

(Approved by AICTE, New Delhi, Affiliated to JNTUK, Kakinada)
Accredited by NAAC with 'A+' Grade.
Recognised as Scientific and Industrial Research Organisation
SRKR MARG, CHINA AMIRAM, BHIMAVARAM – 534204 W.G.Dt., A.P., INDIA

Regulation: R23	**III / IV - B.Tech. I - Semester**

COMPUTER SCIENCE AND BUSINESS SYSTEMS

COURSE STRUCTURE
(With effect from 2023-24 admitted Batch onwards)

Course Code	Course Name	Category	L	T	P	Cr	C.I.E.	S.E.E.	Total Marks
B23CB3101	Data Analytics	PC	3	0	0	3	30	70	100
B23CB3102	Computer Networks	PC	3	0	0	3	30	70	100
B23CB3103	Business Intelligence	PC	3	0	0	3	30	70	100
#PE-I	Professional Elective -I	PE	3	0	0	3	30	70	100
#OE-I	Open Elective -I	OE	3	0	0	3	30	70	100
B23CB3109	Data Analytics Lab	PC	0	0	3	1.5	30	70	100
B23CB3110	Computer Networks Lab	PC	0	0	3	1.5	30	70	100
B23CB3111	Full Stack development- II	SEC	0	1	2	2	30	70	100
B23CB3112	User Interface Design Using Flutter (**TinkeringLab**)	ES	0	0	2	1	30	70	100
B23CB3113	Evaluation of Community Service Internship	PR	--	--	--	2	--	50	50
B23MC3101	Employability Skills	MC	2	--	--	--	30	--	30
		TOTAL	**17**	**1**	**10**	**23**	**300**	**680**	**980**

	Course Code	Course
#PE-I	B23CB3104	Object-Oriented Analysis and Design
	B23CB3105	Software Testing Methodologies
	B23CB3106	Artificial Intelligence
	B23CB3107	Automata Theory and Compiler Design
	B23CB3108	12-week MOOC Swayam/NPTEL course recommended by the BoS
#OE-1	Student has to study one Open Elective offered by CE or ECE or EEE or ME or S&H from the list enclosed.	

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3101	PC	3	--	--	3	30	70	3 Hrs.

DATA ANALYTICS

(for CSBS)

Course Objectives: This course is designed to:

1.	To explore the fundamental concepts of data analytics
2.	To learn the principles and methods of statistical analysis
3.	Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms

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

S.No	Outcome	Knowledge Level
1.	Understand the impact of data management, architecture, and data quality for business decisions and strategy	K2
2.	Apply data analysis and statistical analysis using tools, data modeling techniques and business modeling approaches	K3
3.	Discuss regression and logistic regression concepts with assumptions, estimation, model construction, and business applications	K2
4.	Interpret segmentation, decision tree methods, time series techniques for prediction	K2
5.	Describe visualization techniques for complex data and relationships.	K2

SYLLABUS

UNIT-I (10Hrs)	**Data Management:** Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data) and Data Processing & Processing.
UNIT-II (8 Hrs)	**Data Analytics:** Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling
UNIT-III (10 Hrs)	**Regression –** Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc. Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc
UNIT-IV (10 Hrs)	**Object Segmentation:** Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc. Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyse for prediction.

UNIT-V (8 Hrs)	**Data Visualization:** Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.
Textbooks:	
1.	Student's Handbook for Associate Analytics – II, III..
2.	Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers
Reference Books:	
1.	Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006
3.	Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway Labs Jeffrey D Ullman Stanford Univ.

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3102	PC	3	--	--	3	30	70	3 Hrs.

COMPUTER NETWORKS

(For CSBS)

Course Objectives:

1.	To understand the different types of networks.
2.	To discuss the software and hardware components of a network.
3.	To develop an understanding of the principles of computer networks.
4.	To calculate IPv4 subnet addresses proficiently and explain network layer protocols such as IP, ICMPv4, and routing algorithms.
5.	To explain the functionalities of transport layer protocols (TCP and UDP), including flow control, error control, and congestion control mechanisms. Describe common application layer protocols like HTTP, Telnet, and DNS and their respective roles in networking applications.

Course Outcomes

S.No	Outcome	Knowledge Level
1.	**Explain** protocol layering, digital, analog signals, data rates, and performance issues in the physical layer.	K3
2.	**Explain** transmission media, switching, link layer addressing, and error handling.	K2
3.	**Explain** various data link layer protocols.	K2
4.	**Calculate** IPv4 subnet addresses, explain network layer protocols.	K3
5.	**Explain** transport layer and application layer protocols	K2

SYLLABUS

UNIT-I (10Hrs)	**Introduction:** Data communications, Networks, Network Types, Standards and administration; Protocol Layering, TCP/IP Protocol suite, OSI Model (introduction); Introduction to Physical layer: Data and Signals, Periodic analog signals, Digital signals, Transmission impairments, data rate limits, performance.
UNIT-II (10 Hrs)	**Transmission Media:** Introduction, Guided media, Un-guided media. Switching: Introduction, Circuit-Switched networks, Packet switching, Structure of a switch. **Data Link Layer:** Introduction, Link-layer addressing. Error Detection and Correction: Types of errors, Block Coding, Cyclic Redundancy Check, Checksum. Hamming code
UNIT-III (10 Hrs)	**Data Link Control:** DLC Services, Framing, Finite State Machine (FSM), Stop-and-Wait protocol, HDLC, PPP. Media Access Control (MAC): Random Access, ALOHA, CSMA, CSMA/CD, CSMA/CA, Controlled access: reservation, polling, token passing. Channelization: FDMA, TDMA, CDMA. Introduction to Ethernet and types of Ethernet.

UNIT-IV (10 Hrs)	**Network Layer:** network layer services, packet switching, network layer performance, IPv4 addressing, DHCP, NAT, Forwarding of IP Packets. Network Layer Protocols: Internet Protocol (IP), Datagram Format, ICMPv4, Distance vector and Link state routing. Hierarchical routing, Introduction to IPv6.
UNIT-V (10 Hrs)	**Transport Layer**: Services, flow control, error control, congestion control, connectionless and connection-oriented protocols, Stop-and-wait, Go-back-N. UDP and TCP segment formats. TCP services, connection establishment, TCP three-way handshake, TCP States, and state transition diagram. **Application Layer protocols:** HTTP, Telnet, DNS.

Textbooks:	
1.	Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, McGraw Hill Publication, 2017.
2.	Andrew Tanenbaum, Feamster Wetherall, Computer Networks, 6th Edition, Global Edition
Reference Books:	
1.	James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson, 2019.
2.	Youlu Zheng, Shakil Akthar, "Networks for Computer Scientists and Engineers", Oxford Publishers, 2016.
3.	Computer Networks and Internets, Douglas E Corner, fourth Edition, Pearson Education.
e-Resources	
1.	Cisco Networking Academy, CCNAv7 Introduction to Networks
2.	https://www.geeksforgeeks.org/computer-networks-for-gate/
3.	https://www.netacad.com/courses/ccna-introduction-networks?courseLang=en-US
4.	https://www.cisco.com/c/en/us/solutions/enterprise-networks/what-is-computer-networking.html
5.	https://www.cisco.com/site/in/en/products/networking/index.html

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3103	PC	3	--	--	3	30	70	3 Hrs.

BUSINESS INTELLIGENCE

(for CSBS)

Course Objectives: This course is designed to:

1.	To appreciate e-Business as a significant business segment of the future
2.	To develop capacity to initiate/lead an e-business venture/ business segment
3.	To understand principles of BI and Analytics at conceptual level
4.	To understand principles of BI and Analytics at conceptual level
5.	To develop skills to design BI and Analytics projects

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

S.No	Outcome	Knowledge Level
1.	**Understand** the basic concepts of business intelligence and its application	K2
2.	**Elucidate** the role of business intelligence and its value chain analysis.	K3
3.	**Describe** the use of Online Analytical Processing to analyze and interpret data	K3
4.	**Ability** to perform the preprocessing of data and apply mining techniques on it	K3
5.	**Identify** the needs and patterns for business domains by applying various Classification and clustering techniques.	K2

SYLLABUS

UNIT-I (8 Hrs)	**Business Intelligence an Introduction:** Introduction - Definition - History and Evolution - Business Intelligence Segments - Difference between Information and Intelligence - Defining Business Intelligence Value Chain - Factors of Business Intelligence System - Real time Business Intelligence - Business Intelligence Applications.
UNIT-II (8 Hrs)	**Essentials of Business Intelligence:** Introduction - Creating Business Intelligence Environment - Business Intelligence Landscape - Types of Business Intelligence - Business Intelligence Platform -Applications in Business Analytics -Dynamic roles in Business Intelligence - Challenges - Business Intelligence Tools - Modern Business Intelligence - Enterprise Business Intelligence - Information Workers.
UNIT-III (10 Hrs)	**Business Intelligence User Model:** Introduction - Business Intelligence Opportunity Analysis Overview - Content Management System - End User Segmentation - Basic Reporting and Querying - Online Analytical Processing - OLAP Techniques - OLAP Applications - Applying OLAP to Data Warehousing - Benefits of using OLAP – Dashboard -Key Performance Indicators -Advanced/Emerging BI Technologies - Future

	of Business Intelligence- Critical Challenges for Business Intelligence success.
UNIT-IV (8 Hrs)	**Data mining:** Definition of data mining, Models and methods for data mining, Data mining, classical statistics and OLAP, Applications of data mining, Representation of input data, Data mining process, Analysis methodologies, **Data preparation:** Data validation, Incomplete data, Data affected by noise, Data transformation, Standardization, Feature extraction, Data reduction, Sampling, Feature selection, Principal component analysis, Data discretization.
UNIT-V (8 Hrs)	**Mining Frequent Patterns:** Basic Concept – Frequent ItemSet Mining Methods – Mining Association Rules – Association to Correlation Analysis. **Classification and Prediction**: Issues – Decision Tree Induction – Bayesian Classification – Rule Based Classification – kNearest mining Classification. Prediction –Accuracy and Error measures. Clustering: Overview of Clustering – Types of Data in Cluster Analysis – Major Clustering Methods.

Textbooks:	
1.	Cindi Howson; Successful Business Intelligence McGraw-Hill & Osborne Media
2.	Larissa T. Moss, Shaku Atre Business Intelligence Roadmap 9th 2007 Addison Wesley 2003.
3.	Rajiv Sabherwal, Irma Becerra Fernandez Business Intelligence: Practices, Technologies, and Management 2nd Wiley & Sons 2011
4.	Business Intelligence: Data Mining and Optimization for Decision Making Carlo Vercellis 2009 John Wiley & Sons, Ltd. ISBN: 978-0-470-51138-1.
Reference Books:	
1.	Efraim Turban, Ramesh Sharda, Jay E. Aronson, David King Business Intelligence: A Managerial Approach 9th Prentice Hall Year 2013
2.	Graham, Benjamin The Intelligent Investor Revised Harper Business 2013.
3.	Jiawei Han, Micheline Kamber and Jian Pei, “Data Mining Concepts and Techniques”, Third Edition, Elsevier Publisher, 2006.

Course code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3104	PE	3	--	--	3	30	70	3 Hrs.

OBJECT-ORIENTED ANALYSIS AND DESIGN

(for CSBS)

Course Objectives: This course is designed to:

1.	Become familiar with all phases of OOAD
2.	Understand how to solve complex problems.
3.	Analyze and design solutions to problems using object toriented approach
4.	Study the notations of Unified Modeling Language
5.	Learn the Object design Principles and understand how to apply them towards Implementation

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

S.No	Outcome	Knowledge Level
1.	**Ability** to find solutions to complex problems using object oriented	K2
2.	**Represent** classes, responsibilities and states using UML notation	K3
3.	**Identify** classes and responsibilities of the problem domain	K3
4.	**Develop** robust object-based models for Systems	K3
5.	**Inculcate** necessary skills to handle complexity in software design	K3

SYLLABUS

UNIT-I (8 Hrs)	**Introduction:** The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems. **Case Study:** System Architecture: Satellite-Based Navigation
UNIT-II (8 Hrs)	**Introduction to UML:** Importance of modeling, principles of modeling, object- oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle. Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. **Case Study:** Control System: Traffic Management.
UNIT-III (10 Hrs)	**Class & Object Diagrams:** Terms, concepts, modelling techniques for Class & Object Diagrams. **Advanced Structural Modelling:** Advanced classes,advanced relationships, Interfaces, Types and Roles, Packages. **Case Study:** AI: Cryptanalysis.
UNIT-IV (8 Hrs)	**Basic Behavioural Modelling-I:** Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams. **Case Study:** Web Application: Vacation Tracking System

UNIT-V (8 Hrs)	**Advanced Behavioural Modelling:** Events and signals, state machines, processes and Threads, time and space, state chart diagrams. **Architectural Modelling:** Component, Deployment, Component diagrams and Deployment diagrams. **Case Study:** Weather Forecasting
Textbooks:	
1.	Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, "Object- Oriented Analysis and Design with Applications", 3rd edition, 2013, PEARSON.
2.	Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide,
Reference Books:	
1.	Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.
2.	Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
3.	Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies
4.	Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.
e-Resources	
1.	https://onlinecourses.nptel.ac.in/noc19_cs48/preview

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3105	PE	3	--	--	3	30	70	3 Hrs.

SOFTWARE TETING METHODOLOGIES

(for CSBS)

Course Objectives:

1.	To study the fundamental concepts of software testing which includes objectives, process, criteria, strategies, and methods.
2.	To discuss various software testing types and levels of testing like black and white box testing along with levels unit test, integration, regression, and system testing.
3.	To learn the types of bugs, testing levels with which the student can very well identify a bug and correct as when it happens.
4	It provides knowledge on transaction flow testing and data flow testing techniques so that the flow of the program is tested as well.
5.	To learn the domain testing, path testing and logic based testing to explore the testing process easier.

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

S.No	Outcome	Knowledge Level
1.	**Identify** various bugs and correcting them after knowing the consequences of the bug.	K2
2.	**Illustrate** the functional testing using Transaction flow and domain testing	K3
3.	**Use** of program's control flow as a paths and logic based testing.	K2
4.	**Understand** the State Graphs and Transition testing.	K2
5	**Illustrate** the needs of software test automation and management using the latest tools.	K3

SYLLABUS

UNIT-I (10Hrs)	**Introduction:** Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.
UNIT-II (10 Hrs)	**Transaction Flow Testing:** transaction flows, transaction flow testing techniques. Data Flow testing: Basics of data flow testing, strategies in data flow testing, application of data flow testing. **Domain Testing:** domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability

UNIT-III (10 Hrs)	**Paths, Path products and Regular expressions:** path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection. Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.
UNIT-IV (10 Hrs)	**State, State Graphs and Transition testing**: state graphs, finate state machine, State tables, good state graphs and bad state graphs, state testing, principles of state testing, limitations and Extensions, Testability tips.
UNIT-V (10 Hrs)	**Graph Matrices and Application:** Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like Jmeter/selenium/soapUI/Catalon).
Textbooks:	
1.	Software Testing techniques - Baris Beizer, Dreamtech, second edition.
2.	Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.
Reference Books:	
1.	The craft of software testing - Brian Marick, Pearson Education.
2.	Software Testing Techniques – SPD(Oreille).
3.	Software Testing in the Real World – Edward Kit, Pearson
4.	Art of Software Testing – Meyers, John Wiley.
5.	Effective methods of Software Testing, Perry, John Wiley
E-Resources	
1.	https://nptel.ac.in/courses/106105150
2.	https://www.tutorialspoint.com/software_testing_dictionary/test_tools.html

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3106	PE	3	--	--	3	30	70	3 Hrs.

ARTIFICIAL INTELLIGENCE

(for CSBS)

Course Objectives: This course is designed to:

1.	The student shousld be made to study the concepts of Artificial Intelligence.
2.	The students should be made to learn the methods of solving problems using Artificial Intelligence.
3.	The students should be made to learn the methods of solving problems using Artificial Intelligence.

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

S.No	Outcome	Knowledge Level
1.	**Describe** the basic foundations and applications of AI	K2
2.	**Apply** the problem-solving strategies to generate best AI solutions using state space search for real time problems	K3
3.	**Use** propositional, predicate & Fuzzy logic concepts to process knowledge base	K3
4.	**Illustrate** Knowledge representation and uncertainty techniques to represent real time knowledge base problems	K3
5.	**Classify** various planning mechanisms, expert systems and its applications	K3

SYLLABUS

UNIT-I (8 Hrs)	**Introduction, history, intelligent systems, foundations of AI, intelligent agents**: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation, applications, tic-tac-toe game playing.
UNIT-II (8 Hrs)	**Problem solving:** state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction. **Problem reduction and game playing:** Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games
UNIT-III (10 Hrs)	**Logic concepts:** Introduction, propositional calculus, propositional logic, natural deduction system, axiomatic system, semantic tableau system in propositional logic, resolution refutation in propositional logic, predicate logic. Uncertainty, Fuzzy Logic, Membership Functions, Fuzzy set operations.

UNIT-IV (8 Hrs)	**Knowledge representation:** Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure. Reasoning under uncertainty, review of probability, Bayes' probabilistic interferences and dempster shafer theory.
UNIT-V (8 Hrs)	Planning, components of Planning system, Goal Stack Planning, Non Linear planning with constraint posting, Hierarchical planning, Reactive systems. **Expert system and applications:** Introduction phases in building expert systems, expert system versus traditional systems, Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells,

Textbooks:	
1.	Artificial Intelligence- Saroj Kaushik, CENGAGE Learning.
2.	Artificial intelligence, A modern Approach, 2nded, Stuart Russel, Peter Norvig, PEA.
Reference Books:	
1.	Artificial Intelligence- Deepak Khemani, TMH, 2013.
2.	Introduction to Artificial Intelligence, Patterson, PHI.
3.	Artificial intelligence, structures and Strategies for Complex problem solving, George F Lugar, 5th ed, PEA.

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3107	PE	3	--	--	3	30	70	3 Hrs.

AUTOMATA THEORY AND COMPILER DESIGN

(for CSBS)

Course Objectives: This course is designed to:

1.	To learn the fundamentals of Finite Automata and Context-Free Grammars and Languages, establishing a foundation for understanding computational models.
2.	To understand the relationship between Regular Expressions and Finite Automata and identify Regularity of Languages using the Pumping Lemma.
3.	To learn the concepts of Pushdown Automata and their equivalence to Context-Free Grammars, and to gain knowledge on Turing Machines and their variations.
4.	To introduce the fundamental phases of a Compiler, with a focus on understanding the processes of Lexical Analysis and Syntax Analysis.
5.	To explore the concepts involved in the later stages of Compiler Design, including Semantic Analysis, Intermediate Code Generation, and introductory techniques for Code Optimization.

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

S.No	Outcome	Knowledge Level
1.	Apply DFA and NFA concepts to design models for simple applications like text search ,RL acceptance	K3
2.	Build finite automata from the regular expressions and parse trees from the context free grammars	K3
3.	Construct Context-Free Grammars for language syntax and analyze derivations, parse trees, and ambiguity in relation to PDAs.	K3
4.	Apply the principles of lexical analysis for token recognition and syntax analysis for basic parsing in compiler construction.	K3
5.	Apply semantic rules, intermediate code forms (like three-address code), and basic optimization techniques in compiler design.	K3

SYLLABUS

UNIT-I (10Hrs)	**Introduction to Finite Automata**: Structural Representations, Automata and Complexity, Chomsky Hierarchy, The Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems. **Nondeterministic Finite Automata**: Formal Definition, an Application-Text Search, Finite Automata with Epsilon-Transitions. **Deterministic Finite Automata**: Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA
UNIT-II (10Hrs)	**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 (12 Hrs)	**Push Down Automata**: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state and empty stack. **Turing Machines**: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine, Types of Turing Machine-Multi-Tape Turing Machine, Non-Deterministic Turing Machine.
UNIT-IV (12 Hrs)	**Introduction to Compiler Design**: 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 (10Hrs)	**Semantic Analysis**: 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. **Code Optimization and Generation**: Principle sources of Optimization, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Issues in the design of a code Generator, The Target Language, A simple code Generator, Peephole Optimization.
Text Books:	
1.	Introduction to Automata Theory, Languages, and Computation, 3nd 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, Jeffry D. Ullman, 2nd Edition, Pearson.
Reference Books:	
1.	Introduction to Languages and The Theory of Computation, John C. Martin, McGraw Hill.
2.	Theory of Computer Science-Automata, Languages and Computation, K.L.P.Mishra and N.Chandrasekaran, 3rd Edition, PHI, 2007
3.	Compiler Construction‖, K.V.N. Sunitha, Pearson, 2013
4.	Compiler Design, SandeepSaxena, Rajkumar Singh Rathore, S.Chand publication
5.	Theory of Computer Science – Automata languages and computation, Mishra and Chandra shekaran, 2nd Edition, PHI.
E-Resources	
1.	https://onlinecourses.nptel.ac.in/noc21_cs07/preview

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3109	**PC**	**--**	**--**	3	**1.5**	**30**	**70**	**3 Hrs.**

DATA ANALYTICS LAB

(For CSBS)

Course Objectives:

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

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

S.No	Outcome	Knowledge Level
1	**Understand** linear regression and logistic regression	K3
2	**Understand** the functionality of different classifiers	K3
3	**Implement** visualization techniques using different graphs	K3
4	**Apply** descriptive and predictive analytics for different types of data.	K3

SYLLABUS

1	**Data Preprocessing** a. Handling missing values b. Noise detection removal c. Identifying data redundancy and elimination
2	Implement any one imputation mode
3	Implement Linear Regression
4	Implement Logistic Regression
5	Implement Decision Tree Induction for classification
6	Implement Random Forest Classifier
7	Implement ARIMA on Time Series data
8	Object segmentation using hierarchical based method
9	Perform Visualization techniques (types of maps - Bar, Colum, Line, Scatter, 3D Cubes etc)
10	Perform Descriptive analytics on Healthcare data
11	Perform Predictive analytics on Product Sales data
12	Apply Predictive analytics for Weather forecasting

Textbooks:

1	Student's Handbook for Associate Analytics
2	Datamining Concepts and Techniques, Han, Kamber, 3rdEdition, Morgan Kaufmann Publishers

Reference Books:

1	Introduction to Data Mining, Tan, Steinbachand Kumar, Addison Wesley, 2006

2	Data Mining Analysis and Concepts, M.Zaki and W.Meira
3	Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway Labs Jeffrey D Ullman Stanford Univ.

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3110	**PC**	**--**	**--**	**3**	**1.5**	**30**	**70**	**3 Hrs.**

COMPUTER NETWORKS LAB

(For CSBS)

Course Objectives:

1	Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP
2	To provides a practical approach to Ethernet/Internet networking
3	How Networks are assembled and experiments are made to understand the layered architecture and how do some important protocols work

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

S.No	Outcome	Knowledge Level
1	**Analyze** data link layer services. Functions like error detection	K3
2	**Understand** sliding window protocol mechanisms	K3
3	**Analyse** Shortest distance algorithms for given topology	K3
4	**Understand** Work on various network simulators	K3

SYLLABUS

1	Write a Program to implement error detection using a) Check Sum b) CRC
2	Write a Program to implement Sliding window protocol for a) Go back N ARQ b) Selective repeat ARQ
3	Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).
4	Basic Switch Configurations on Packet Trace Simulator
5	Basic Router Configurations on Packet Trace simulator
6	Implementing Static Routing for the given topology
7	Implementing Dynamic routing RIPV1 & RIPV2 for the given topology
8	Implementing OSPF routing for the given topology
9	Implementing VLAN on Packet tracer
10	Implementing Internal VLAN routing on Packet Tracer
11	Write a program for congestion control using leaky bucket algorithm
12	Wireshark i. Packet Capture Using Wire shark ii. Starting Wire shark iii. Viewing Captured Traffic iv. Analysis and Statistics & Filters
13	Operating System Detection using Nmap & How to run Nmap scan

14	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
Reference Books:	
1	Data Communications and Networks- Achut S Godbole, AtulKahate
2	Computer Networks, Mayank Dave, CENGAGE

Course Code	Category	L	T	P	C	C.I.E.	S.E. E	Exam
B23CB3111	SEC	--	1	2	2	30	70	3 Hrs.

FULL STACK DEVELOPMENT-II

(For CSBS)

Course Objectives:

1	To implement Forms, inputs and Services using AngularJS
2	To develop a simple web application using Nodejs; Angular JS and Express
3	To implement data models using MongoDB

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

S.No	Outcome	Knowledge Level
1	**Apply** MongoDB queries to implement CRUD operations on a document- based database	K3
2	**Apply** Express.js and RESTful API concepts to develop a single-page web application.	K3
3	**Apply** ReactJS concepts including components, props, and state to render dynamic data in a web application.	K3
4	**Apply** router and hooks in designing ReactJS applications.	K3

SYLLABUS

1	**Experiment 1: Node.js**
	a. Write a program to show the workflow of JavaScript code executable by creating web server in Node.js.
	b. Write a program to transfer data over http protocol using http module.
	c. Create a text file src.txt and add the following content to it. (HTML, CSS, Javascript, Typescript, MongoDB, Express.js, React.js, Node.js)
	d. Write a program to parse an URL using URL module.
	e. Write a program to create an user-defined module and show the workflow of Modularization of application using Node.js
2	**Experiment 2: Typescript**
	a. Write a program to understand simple and special types.
	b. Write a program to understand function parameter and return types.
	c. Write a program to show the importance with Arrow function. Use optional, default and REST parameters.
	d. Write a program to understand the working of typescript with class, constructor, properties, methods and access specifiers.
	e. Write a program to understand the working of namespaces and modules.
	f. Write a program to understand generics with variables, functions and constraints.

	Experiment 3-5: Augmented Programs: (Any 2 must be completed from Experiment 3-5)
	3. Write a CSS program, to apply 2D and 3D transformations in a web page.
	4. a web page with new features of HTML5 and CSS3.
	5. Design a to-do list application using JavaScript.
6	**Experiment 6: ExpressJS – Routing, HTTP Methods, Middleware**
	a. Write a program to define a route, Handling Routes, Route Parameters, Query Parameters and URL building.
	b. Write a program to accept data, retrieve data and delete a specified resource using http methods.
	c. Write a program to show the working of middleware.
7	**Experiment 7: ExpressJS – Templating, Form Data**
	a. Write a program using templating engine.
	b. Write a program to work with form data.
8	**Experiment 8: ExpressJS – Cookies, Sessions, Authentication**
	a. Write a program for session management using cookies and sessions.
	b. Write a program for user authentication
9	**Experiment 9: ExpressJS – Database, RESTful APIs**
	a. Write a program to connect MongoDB database using Mangoose and perform CRUD operations.
	b. Write a program to develop a single page application using RESTful APIs
10	**Experiment 10: ReactJS – Render HTML, JSX, Components – function & Class**
	a. Write a program to render HTML to a web page.
	b. Write a program for writing markup with JSX.
	c. Write a program for creating and nesting components (function and class).
11	**Experiment 11: ReactJS – Props and States, Styles, Respond to Events**
	a. Write a program to work with props and states.
	b. Write a program to add styles (CSS & Sass Styling) and display data.
	c. Write a program for responding to events.
12	**Experiment 12: ReactJS – Conditional Rendering, Rendering Lists, React Forms**
	a. Write a program for conditional rendering.
	b. Write a program for rendering lists.
	c. Write a program for working with different form fields using react forms
13	**Experiment 13: ReactJS – React Router, Updating the Screen**
	a. Write a program for routing to different pages using react router.
	b. Write a program for updating the screen.
14	**Experiment 14: ReactJS – Hooks, Sharing data between Components**
	a. Write a program to understand the importance of using hooks.
	b. Write a program for sharing data between components
15	**Experiment 15: ReactJS Applications – To-do list and Quiz**
	a. Design to-do list application

16	**Experiment 16: MongoDB – Installation, Configuration, CRUD operations**
	a. Install MongoDB and configure ATLAS
	b. Write MongoDB queries to perform CRUD operations on document using insert(), find(), update(), remove()
17	**Experiment 17: MongoDB – Databases, Collections and Documents**
	a. Write MongoDB queries to Create and drop databases and collections.
	b. Write MongoDB queries to work with documents using find(), limit(), sort(), createIndex(), aggregate()
18	**Experiment 18-20: Augmented Programs: (Any 2 must be completed)**
	18. Design a to-do list application using NodeJS and ExpressJS.
	19. Design a Quiz app using ReactJS.
	20. Complete the MongoDB certification from MongoDB University website.
Text Books:	
1	Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
2	Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, A Press, O'Reilly.
E-Resources:	
1	ExpressJS - https://www.tutorialspoint.com/expressjs .MongoDB -
2	ReactJS - https://www.w3schools.com/REACT (and) https://react.dev/learn#

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3112	ES	--	--	2	1	30	70	3 Hrs.

USER INTERFACE DESIGN USING FLUTTER (TINKERING LAB)

(For CSBS)

Course Objectives:

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

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

S.No	Outcome	Knowledge Level
1.	**Develop** mobile user interfaces using Flutter widgets like Text, Image, Container, Row, and Column.	K3
2.	**Implement** responsive layouts using Flutter's layout widgets and media queries to support multiple screen sizes.	K3
3.	**Use** Flutter's navigation system to create multi-screen applications with both direct and named route navigation.	K3
4.	**Apply** appropriate widget types (stateless or stateful) in Flutter applications to manage UI updates based on user interactions.	K3
5.	**Apply** navigation techniques and basic state management using set State and named routes in Flutter applications.	K3

SYLLABUS

1.	a) Install Flutter and Dart SDK. b) Write a simple Dart program to understand the language basics.
2.	a) Explore various Flutter widgets (Text, Image, Container, etc.). b) Implement different layout structures using Row, Column, and Stack widgets.
3.	a) Design a responsive UI that adapts to different screen sizes. b) Implement media queries and breakpoints for responsiveness.
4.	a) Set up navigation between different screens using Navigator. b) Implement navigation with named routes.
5.	a) Learn about stateful and stateless widgets. b) Implement state management using set State and Provider.
6.	a) Create custom widgets for specific UI elements. b) Apply styling using themes and custom styles.
7.	a) Design a form with various input fields. b) Implement form validation and error handling.
8.	a) Add animations to UI elements using Flutter's animation framework. Experiment with different types of animations (fade, slide, etc.).
9.	a) Fetch data from a REST API. Display the fetched data in a meaningful way in the UI.
10.	a) Write unit tests for UI components.

	b) Use Flutter's debugging tools to identify and fix issues.
Reference Books:	
1.	Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.
2.	Rap Payne, Beginning App Development with Flutter: Create Cross-Platform Mobile Apps 1st Edition, Apres
3.	Richard Rose, Flutter & Dart Cookbook, Developing Full stack Applications for the Cloud, Oreilly.
E-Resources:	
1.	https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_SMARTBRIDGE_06
2.	https://onlinecourses.nptel.ac.in/noc21_ar05/preview

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23MC3102	MC	2	--	--		30		

EMPLOYABILITY SKILLS

(For AIML, CSBS, CSE, IT and MECH)

Course Objectives:

1.	To introduce concepts required in framing grammatically correct sentences and identifying errors while using standard English.
2.	To acquaint the learner of making a coherent and cohesive sentences and paragraphs for composing a written discourse.
3.	To inculcate logical thinking in order to frame and use data as per the requirement.

Course Outcomes

S.No	Outcome	Knowledge Level
1.	Match various vocabulary items that appear in competitive examinations with their contextual meanings accurately.	K1
2.	Identify grammatical and ungrammatical usage of English language in all the grammar related questions asked in various competitive examinations like CAT, GRE, IBPS.	K3
3.	Infer meaning from complex texts that are set as questions in different competitive examinations held for higher education or employment	K2
4.	Find solutions to complex arithmetic problems set as questions in the competitive examinations held for employment or higher education	K1
5.	Apply logical thinking abilities in solving the problems of reasoning that appear in the examinations like CAT, GRE, GATE, IBPS.	K3

SYLLABUS

UNIT-I (10Hrs)	Synonyms, Antonyms, Frequently Confused Words, Foreign Phrases, Idioms and Phrasal Verbs, Collocations. Spotting Errors, Sentence Improvement
UNIT-II (10 Hrs)	Time and work, Pipes and Cisterns. Time and Distance Problems, Problems on boats and streams. Percentages, Profit and loss, Simple interest and Compound interest. Discount Problems.
UNIT-III (10 Hrs)	Analogies, Odd One Out. (Verbal ability) Number Series, Letter Series, Analogy, Alpha Numeric Series, Order and Ranking, Directions, Data sufficiency, Syllogisms.
UNIT-IV (10 Hrs)	Sentence Completion, Sentence Equivalence, Close Test Reading Comprehension , Para Jumbles

UNIT-V (10 Hrs)	Number System: Divisibility tests, finding remainders in various cases, Problems related to numbers, Methods to find LCM, Methods to find HCF.
Textbooks:	
1.	*How to Prepare for Verbal Ability and Reading Comprehension for CAT* (10th edition) by Arun Sharma and Meenakshi Upadhyay, McGraw Hill Education, 2022.
2.	*How to Prepare for Quantitative Aptitude for CAT (10th edition) by* by Arun Sharma , McGraw Hill Education, 2022.
Reference Books:	
1.	*English Collocation in Use*- Intermediate (2nd edition) by Michael McCarthy& Felicity O'Dell, CUP, 2017.
2.	*Magical Book On Quicker Maths* (5th Edition) By M.Tyra, BSC Publishing Co Pvt. Ltd, 2018.
e-Resources	
1.	www.Indiabix.com
2.	www.800score.com

Regulation: R23	**III / IV - B.Tech. II - Semester**

COMPUTER SCIENCE AND BUSINESS SYSTEMS

COURSE STRUCTURE
(With effect from 2023-24 admitted Batch onwards)

Course Code	Course Name	Category	L	T	P	Cr	C.I.E.	S.E.E.	Total Marks
B23CB3201	Cloud Computing	PC	3	0	0	3	30	70	100
B23CB3202	Financial and Cost Accounting	PC	3	0	0	3	30	70	100
B23CB3203	Machine Learning	PC	3	0	0	3	30	70	100
#PE-II	Professional Elective -II	#PE-II	3	0	0	3	30	70	100
#PE-III	Professional Elective -III	#PE-III	3	0	0	3	30	70	100
#OE-II	Open Elective -II	#OE-II	3	0	0	3	30	70	100
B23CB3214	Business Intelligence and Machine Learning Lab	PC	0	0	3	1.5	30	70	100
B23CB3215	Cloud Computing Lab	PC	0	0	3	1.5	30	70	100
B23BS3201	Soft skills or IELTS	SEC	0	1	2	2	30	70	100
B23AC3201	Technical Paper Writing & IPR	AC	2	--	--	--	30	--	30
		TOTAL	**20**	**1**	**8**	**23**	**300**	**630**	**930**

	Course Code	Course
#PE-II	B23CB3204	Cryptography & Network Security
	B23CB3205	Principles of Cyber Security
	B23CB3206	Digital Marketing
	B23CB3207	DevOps
	B23CB3208	MOOCS-II
#PE-III	B23CB3209	Software Project Management
	B23CB3210	Ad hoc and Sensor Networks
	B23CB3211	Natural Language Processing
	B23CB3212	Financial Analytics
	B23CB3213	MOOCS-III
#OE-II	Student has to study one Open Elective offered by CE or ECE or EEE or ME or S&H from the list enclosed.	
*Mandatory Industry Internship /Mini Project of 08 weeks duration during summer vacation		

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3201	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

CLOUD COMPUTING

(for CSBS)

Course Objectives: Students are expected to learn

1.	To explain the evolving utility computing model called cloud computing
2.	To introduce the various levels of services offered by cloud.
3.	To discuss the fundamentals of cloud enabling technologies such as distributed computing, service-oriented architecture and virtualization.
4.	To emphasize the security and other challenges in cloud computing.
5.	To introduce the advanced concepts such as containers, serverless computing and cloud-centric Internet of Things.

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

S.No	Outcome	Knowledge Level
1.	**Interpret** the fundamental concepts and challenges associated with cloud computing.	K3
2.	**Analyze** the economic, financial, and technological factors influencing the adoption of cloud solutions in organizations.	K3
3.	**Assess** virtualization techniques and resource management strategies for deploying cloud-based applications.	K3
4.	**Evaluate** organizational requirements related to scalability, capacity planning, and security in cloud environments.	K3
5.	**Develop** real-time cloud applications using leading platforms such as AWS, Google Cloud, and Microsoft Azure.	K3

SYLLABUS

UNIT-I (10Hrs)	**Introduction to Cloud Computing Fundamentals:** Cloud computing at a glance, defining a cloud, cloud computing reference model, types of services (IaaS, PaaS, SaaS), cloud deployment models (public, private, hybrid), utility computing, cloud computing characteristics and benefits, cloud service providers (Amazon Web Services, Microsoft Azure, Google AppEngine.
UNIT-II (10 Hrs)	**Cloud Enabling Technologies** Ubiquitous Internet, parallel and distributed computing, elements of parallel computing, hardware architectures for parallel computing (SISD, SIMD, MISD, MIMD), elements of distributed computing, Inter-process communication, technologies for distributed computing, remote procedure calls (RPC), service-oriented architecture (SOA), Web services.

UNIT-III (10 Hrs)	**Virtualization and Containers** Characteristics of virtualized environments, taxonomy of virtualization techniques, virtualization and cloud Computing, pros and cons of virtualization, technology examples (XEN, VMware), building blocks of containers, container platforms (LXC, Docker), container orchestration, Docker Swarm and Kubernetes, public cloud VM (e.g. Amazon EC2) and container (e.g. Amazon Elastic Container Service) offerings.
UNIT-IV (10 Hrs)	**Cloud computing challenges** Economics of the cloud, cloud interoperability and standards, scalability and fault tolerance, energy efficiency in clouds, federated clouds, cloud computing security, fundamentals of computer security, cloud security architecture, cloud shared responsibility model, security in cloud deployment models.
UNIT-V (10 Hrs)	**Advanced concepts in cloud computing** Serverless computing, Function-as-a-Service, serverless computing architecture, public cloud (e.g. AWS Lambda) and open-source (e.g. OpenFaaS) serverless platforms, cloud-centric IoT - IoT architecture and cloud layers, edge and fog computing – Edge vs Fog vs Cloud, Introduction to DevOps – CI/CD, infrastructure-as-code, Quantum-as-a-Service (QaaS).

Textbooks:	
1.	Mastering Cloud Computing, 2nd edition, Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, Shivananda Poojara, Satish N. Srirama, Mc Graw Hill, 2024
2.	Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012
Reference Books:	
1.	Cloud Computing, Theory and Practice, Dan C Marinescu, 2nd edition, MK Elsevier, 2018
2.	Essential of Cloud Computing, 1st Edition, K Chandrasekharan, CRC Press, 2014.
3.	Online documentation and tutorials from cloud service providers (e.g., AWS, Azure, GCP)
4.	Cloud Computing, Theory and Practice, Dan C Marinescu, 1st edition, MK Elsevier, 2013.

Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3202	**PC**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

FINANCIAL AND COST ACCOUNTING

(For CSBS)

Course Objectives:

1.	To provide an understanding of the application of various principles and practice of accounting.
2.	To demonstrate the knowledge on the process of accounting cycle and basic steps involved in accounting.
3.	To apply the knowledge of systematic maintenance of books of accounts to real life business.
4.	To estimate the cost of cost center by using costing techniques
5.	To estimate Annual Financial statements of Sole proprietorship and Company form of business.

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

S. No	Outcome	Knowledge Level
1.	Interpret the application of various principles and practice of accounting in preparation of accounting statements	K2
2.	Demonstrate the knowledge on the process of accounting cycle	K3
3.	Demonstrate the process of analyzing and interpreting the financial statements	K3
4.	Finding the cost of cost center by using cost accounting tools and techniques	K3
5.	**Demonstrate** the preparation of Annual Financial statements and reports as per company's Act	K3

SYLLABUS

UNIT-I (10Hrs)	Introduction to Accounting: Importance, Objectives and Principles, Accounting Concepts and conventions, and The Generally Accepted Accounting Principles (GAAP), their implications on accounting system; Double entry system–recording business transactions–Classification of accounts– –Accounting cycle.
UNIT-II (10 Hrs)	**Accounting Process:** Bookkeeping and Record Maintenance, Fundamental Principles and Double Entry, Journal, Ledger, Trial Balance, Balance Sheet, Final Accounts, Cash Book and Subsidiary Books, Rectification of Errors
UNIT-III (10 Hrs)	**Financial Statements:** Form and Contents of Financial Statements, Analysing and Interpreting Financial Statements, Accounting Standards. **Cash Flow and Fund Flow Techniques:** Introduction, how to prepare, Difference between them
UNIT-IV (10 Hrs)	**Costing Systems:** Cost analysis and Control**,** , Cost concepts and Managerial use of classification of costs, **Elements** of Cost, Cost Behavior, Cost Allocation, OH Allocation, Unit Costing, Process Costing, Job Costing, Absorption Costing, Marginal Costing, Cost Volume Profit Analysis, Budgets, ABC Analysis

UNIT-V (10 Hrs)	**Company Accounts and Annual Reports:** kinds, share capital, issue of shares, schedules to accounts, financial statements as per Companies Act- 2013, Provisions as to Preparation of Financial Statements, Preparation of Income statement and Balance sheet (horizontal and Vertical), Audit Reports and Statutory Requirements, Directors Report.

Textbooks:	
1.	Robert N Anthony, David Hawkins, Kenneth Marchant, *Accounting: Texts and Cases*, McGraw-Hill
2.	Jain S.P.,& Narang K L. . Basic Financial Accounting I, New Dehli, Kalyani publishers.
3.	Kimmel, Financial accounting, Wiley Publications
4.	Gupta, A.. Financial Accounting for Management: An Analytical Perspective, Noida, Pearson Education.
5.	Cost and Management Accounting, M.N. Arora, Himalaya Publishing House
6.	S. P. Jain and K. L. Narang, Cost and Management Accounting, Kalyani Publishers, New Delhi, 2006.
7.	Manash Gupta, Cost Accounting Principles and Practice, Pearson Education, 2006
Reference Books:	
1.	M. Y. Khan, P. K. Jain, Management Accounting: Theory and Problems, TMH, New Delhi, 4/e, 2007.
2.	James Jiambalvo, Managerial Accounting, John Wiley & Sons, Inc. New Delhi, 2007.
3.	Atkinson, Banker, Kaplan and Young, Management Accounting, PHI, 2006
4.	Paresh Shah, Basic Financial Accounting for Management, Oxford University Press, New Delhi, 2014.
5.	Seema Srivastava, Financial Accounting, Jawaharlal, S. Chand, 2014.

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3203	PC	3	0	0	3	30	70	3 Hrs.

MACHINE LEARNING

(For CSBS)

Course Objectives:

1.	**To introduce** the fundamental concepts, types, applications, and challenges of Machine Learning
2.	**To develop** the ability to implement regression, classification, and clustering algorithms for data-driven decision-making
3.	**To apply** various Machine Learning models and use performance metrics and optimization techniques to assess their effectiveness.
4	**To describe** the principles of advanced Machine Learning models, including ensemble methods, neural networks, and reinforcement learning, and explain their applications.

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

S.No	Outcome	Knowledge Level
1.	**Explain** core Machine Learning concepts, types, challenges, and key principles.	K2
2.	**Apply** appropriate regression techniques, including linear, non-linear, and regularized models like Ridge and Lasso, to solve real-world prediction problems.	K3
3.	**Apply** classification algorithms such as Decision Trees, Naive Bayes, and K-Nearest Neighbors to solve binary, multi-class, and imbalanced classification problems using appropriate evaluation metrics.	K3
4.	**Apply** Support Vector Machines, ensemble learning techniques, and clustering algorithms such as K-Means and K-Medoids to solve classification and clustering problems using appropriate similarity measures.	K3
5.	**Apply** the concepts of Random Forest, Reinforcement Learning, and Artificial Neural Networks to solve real-world classification and decision-making problems.	K3

SYLLABUS

UNIT-I (10Hrs)	**Introduction to Machine Learning:** Definition, Relation between AI, ML, DL, Need of Machine Learning, Types of Machine Learning, Applications, Challenges of Machine Learning, Data Acquisition. Features selections and features extraction, Overfitting Vs Underfitting, Bais and variance.
UNIT-II (10 Hrs)	**Linear Regression, Non-Linear Regression:** Introduction, Key differences between Linear Regression and Non-Linear Regression. **Regularization:** Introduction, Types of Regularization, Ridge Regression vs Lasso Regression. **Logistic Regression:** Binary Classification.

UNIT-III (10 Hrs)	**Classification:** Introduction, Types of learners, Binary classifier, Multi-class classification, Multi label classification, Imbalanced classification. **Decision Tree:** Representation, Decision Tree Learning Algorithm (ID3), Metrics for Evaluating Classifier Performance. **Navie Bayes:** Theorem, Bayesian Classification algorithm. K-Nearest Neighbors: Distance Metrics, (KNN) Algorithm, Limitations.
UNIT-IV (10 Hrs)	**Support Vectors:** Linear SVM, Non-Linear SVM, SVR. **Ensembled Learning:** Bagging, Boosting, Stacking, Random Forest. **Cluster Analysis:** Introduction, Basic Clustering Methods, Measures of Similarity and Dissimilarity. **Partitioning Methods:** K-Means and K-Medoids algorithms.
UNIT-V (10 Hrs)	**Introduction:** Random Forest, Reinforcement Learning. **Dimensionality Reduction:** Principal Component Analysis (PCA). **Artificial Neural Networks (ANN):** Introduction, Biological Neurons, Artificial Neurons, Perceptron, Multi-layer Perceptron, performing logical operations, Feedforward Network, Back propagation Algorithm.
Textbooks:	
1.	Machine Learning, Tom M. Mitchell, First Edition, 2017, McGraw Hill Education.
2.	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, AurelienGeron, Third Edition, 2022, O'Reilly
Reference Books:	
1.	Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, 2012, MIT Press
2.	"Machine Learning for Absolute Beginners" – Oliver Theobald
e-Resources	
1.	Introduction to Machine Learning :https://nptel.ac.in/courses/106105152
2.	Introduction to Machine Learning :https://nptel.ac.in/courses/106106139
3.	Machine Learning :https://nptel.ac.in/courses/106106202

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3204	PE	3	--	--	3	30	70	3 Hrs.

CRYPTOGRAPHY & NETWORK SECURITY

(Common to IT, CSBS)

Course Objectives: Students are expected to learn

1.	Solving problems using algorithm design methods such as the RSA, DES
2.	Analyze the performance of algorithms.
3.	Demonstrate a familiarity with major algorithms and Internet security Protocols.

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

S.No	Outcome	Knowledge Level
1.	**Understand** the mathematical background required for cryptography.	K2
2.	**Apply** the algorithms on security problems	K3
3.	**Apply** symmetric and asymmetric approaches for cryptography.	K3
4.	**Understand** authentication mechanisms for internet security.	K2
5.	**Understand** the principles of Internet security protocols for Internet applications.	K2

SYLLABUS

UNIT-I (10Hrs)	**INTRODUCTION TO NUMBER THEORY:** Prime Numbers, Fermat's and Eulers Theorems, Testing for Primality, The Chinese Remainder Theorem, Euclidean theorem. **INTRODUCTION TO SECURITY:** The need for security-Security approaches, principals of security, plain text and cipher Text- Types of attacks
UNIT-II (10 Hrs)	**CRYPTOGRAPHY CONCEPTS AND TECHNIQUES:** Substitution and Transportation Techniques –Encryption Techniques –Encryption and Decryption-Symmetric and Asymmetric Cryptography – Steganography **SYMMETRIC KEY CRYPTOGRAPHIC ALGORITHMS:** Feistel Cipher Structure, Data encryption standard, Triple DES, Stream Ciphers and RC4.
UNIT-III (10 Hrs)	**ASYMMETRIC KEY CRYPTOGRAPHIC ALGORITHMS:** Overview of asymmetric key cryptography, Diffie Hellman Key exchange, RSA algorithm-symmetric and asymmetric key cryptography together-Message Digest- MAC- HMAC- digital signatures.
UNIT-IV (10 Hrs)	**PUBLIC KEY INFRASTRUCTURE:** Introduction-Digital Certificates-Private Key management-The PKIX model. **USER AUTHENTICATION MECHANISMS:** Introduction-Authentication basics-passwords, authentication tokens-certificate based authentication-biometrics authentication-KDC, Kerberos

UNIT-V (10 Hrs)	**INTERNET SECURITY PROTOCOLS:** Basic concepts -SSL-SHTTP-TSP-SET- SSL versus SET-Email security- Simple SMTP, Privacy Enhanced Mail (PEM), Pretty Good Privacy (PGP) S/MIME, Introduction to firewalls-IP security-Virtual Private Networks

Textbooks:	
1.	Cryptography and Network security, Atul Kahate ,Tata McGraw-Hill Pub company Ltd., New Delhi
2.	Cryptography and network security, principles and Practices by William Stallings, 3rd edition, Pearson Pub
	Computer Security by William Stallings and Lawrie Brown, Pearson Pub
Reference Books:	
1.	Network Security Private Communication in a public world, Charlie Kaufman, Radia Perlman & Mike Speciner, Prentice Hall of India Private Ltd., New Delhi.
2.	Network Security: The Complete Reference by Roberta Bragg, Mark Phodes- Ousley, Keith Strassberg Tata Mcgraw-Hill.

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B23CB3205	PE	3	--	--	3	30	70	3Hrs

PRINCIPLES OF CYBER SECURITY

(Common to IT, CSBS)

Course Objectives: Students are expected to learn

1.	To assess the vulnerability of and apply basic protections for the network, operating systems, and endpoints. To maintain the integrity, confidentiality, and availability of your network and your data.
2.	To learn about different ways to monitor your network and how to evaluate alerts that you receive.
3.	Delve into tools and techniques used to protect your network, including access control, firewalls, cloud security.
4.	To create policy documents that cover governance and compliance, complying with standards of ethics and legal and regulatory frameworks.

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

S.No	Outcome	Knowledge Level
1.	**Explain** various threats, mitigate common attacks, apply security services.	K2
2.	**Use** a layered defense-in-depth cyber security strategy.	K3
3.	**Summarize** wireless, mobile, IoT security issues, along with usage and operation of AAA services.	K3
4.	**Determine** cloud and data security technologies, evaluate alerts, create policy documents that cover governance and compliance. Test and assess network security.	K3
5.	**Explain** network and systems vulnerabilities, risk management plan, forensic investigation, disaster recovery methods.	K3

SYLLABUS

UNIT-I (10Hrs)	**Cyber Treats and Attacks** Types of cyber threats, Deception (Social Engineering) and defending against deception, Types of Cyber Attacks, Wireless and Mobile device attacks, Types of application attacks; Securing Networks: Current state and who is attacking (Threat actors and Cyber criminals), IP Vulnerabilities, ICMP attacks, TCP and UDP Vulnerabilities and attacks; ARP attacks, DNS attacks, DHCP attacks; Common HTTP Exploits, SQL Injection, Cross Site Scripting; Mitigating common network attacks; Fundamentals of Wireless LAN, Types of Wireless LAN Threats; Securing Wireless LAN; Network Security Infrastructure Devices; Security services
UNIT-II (10 Hrs)	**Defense-in-depth** Common Windows Operating System Vulnerabilities, Windows Architecture; Windows configuration and monitoring, Windows Security; Operating Systems Security: Patch Management, Endpoint Security, Host Encryption, Boot

	Integrity; Apple security features, Physical protection for devices. End point Threats, End point security. Host based Malware protection; Network based Malware protection.; Host based firewalls; Host based Intrusion Detection, Application Security; The Cyber Security cube, CIA Triad, Measure to ensure availability, States of data.; Hardware based and software based Cyber security countermeasures. Policies, standards, guidelines, and procedures.; Defense-in-depth: Asset, Vulnerabilities, and Threats. Cyber Security Operations Management. Business Policy, Security Policy, BYOD policy.; Physical security methods, Application Security.; Network Hardening: Services and protocols, Network Hardening: Segmentation
UNIT-III (10 Hrs)	**AAA** Wireless device security, Mobile device security, Various measures for Cyber security resilience.; Threats on Embedded and IoT systems, Access Control types, Definitions: Identity management, Authentication, Authorization; Zero Trust Security, Access Control Methods, Network Access Control (NAC) Systems, Account Management; AAA Usage and Operation; Introduction to Access Control Lists, Wild card masking, Configure ACLs.; Implementing ACLs; Mitigating Attacks with ACLs, IPv6 ACLs; Secure Networks with Firewalls, Firewalls in Network Design; Zone-Based Policy Firewalls (ZPF) Overview, ZPF Operation; ZPF Configuration.
UNIT-IV (10 Hrs)	**Cloud, IT Security and Governance** Virtualization and Cloud Computing, Domains of Cloud Security, Cloud Infrastructure Security, Cloud Application Security; Cloud Data Security, Protecting Virtual Machines; Security Monitoring Protocols, Security Technologies; Security Data: Types of security data, End Device Logs, Network Logs; Evaluating Alerts: Sources of alerts, Alert Evaluation; Governance: Definition, Key roles, Cyber Security policies, Types of Security Policies.; Ethics: Ethics of Cyber Security Specialist, Ten Commandments of Computer Ethics, Types of Cybercrime, Various types of cyber laws.; IT Security Management Framework: Twelve Domains of Cyber security, Introduction to ISO 27000, National Cyber security Workforce Framework, CIS Critical Security Controls and CCM.; Network Security Assessment, Network Security Testing Techniques, Network Security Testing Tools.; Introduction to Penetration Testing;
UNIT-V (10 Hrs)	**CVSS, Risk, Incident Response** Threat Intelligence Sources and Services, Network and Server Profiling, Network Anomaly Detection, Network Vulnerability Testing.; Common Vulnerability Scoring System (CVSS); Secure Device Management; Risk Management and Risk Assessment; Security Controls; Evidence Handling and Attack Attribution; The Cyber Kill Chain; The Diamond Model of Intrusion Analysis; Incident Response; Disaster Recovery.
Reference Books:	
1.	Cyber Security Essentials, Cisco Networking Academy.

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B23CB3206	PE	3	-	-	3	30	70	3 Hrs.

DIGITAL MARKETING

(For CSBS)

Course Objectives: Students are expected to learn

1.	Basics of Digital Marketing
2.	Digital Metrics
3.	Search Engine Optimization including Search Engine Advertising
4.	Social Media Marketing on Facebook, LinkedIn
5.	Indian Aspect of Digital Marketing

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

S.No	Outcome	Knowledge Level
1.	**Relate** the Basics of Digital Marketing in the Modern Era.	K3
2.	**Apply** the Display Advertising Concepts	K3
3.	**Prepare** for the Search Engine Optimization/Advertising	K3
4.	**Prepare** for the Social Media Marketing Tactics	K3
5.	**Predict** the Scope of Digital Marketing in Indian Context	K2
6.	**Solve** the Digital Marketing Aspects	K3

SYLLABUS

UNIT-I (10Hrs)	**Basics of Digital Marketing** Definition of Digital Marketing-Evolution of Digital Marketing: from traditional to modern marketing, the rise of the internet: The Dotcom Era, Post Dotcom: Creation of Internet Business Models-emergence of digital marketing as a new tool-Application of Digital Marketing.
UNIT-II (10 Hrs)	**Display Advertising** Concept of Display Advertising: Display Advertising Media, Digital Metrics-Types of Display Ads: Format, Display Ad Size- Buying Models: Cost per Click (CPC), Cost per Milli (CPM), Cost per Lead (CPL), Cost per Acquisition (CPA), Fixed cost/ Sponsorship.
UNIT-III (10 Hrs)	**Search Engine Advertising and Search Engine Optimization** Introduction about how search engine works, why pay for Search Advertising: Capture Intent, Ease of Action, Controlled Costs, Analytics, Competition-Understanding Ad Placements: Top, Side, Bottom-Concept of Search Engine Optimization, Important elements to be considered in Search Engine Optimization.

UNIT-IV (10 Hrs)	**Social Media Marketing** Introduction to Social Media Marketing- Building a Successful Strategy: Listen, Goal Setting, Strategy, Implementation, Measure, Improve-Facebook Marketing-LinkedIn Marketing-Twitter Marketing-Instagram and Snapchat.
UNIT-V (10 Hrs)	**Digital Marketing – The Indian View** India Digital Spend Overview, Emerging trends of Digital Marketing: Big Data and IoT- Data technologies Impacting Marketing, B2B and SMB – Segments based Digital Marketing, SoLoMo – the Next level of Hyperlocal Marketing.

Textbooks:

1.	Fundamentals of Digital Marketing by Puneet Singh Bhatia, Pearson Publishers, 2nd Edition 2019
2.	Digital Marketing by Seema Gupta, Mc GrawHill Publishers, 2nd Edition 2020

Reference Books:

1.	Digital Marketing by Dave Chaffey and Fiona Ellis- Chadwick by Pearson Publishers, 2019
2.	Applications of Digital Marketing for success in Business by Abhishek Das, BPB Publications, 2018
3.	Fundamentals of Digital Marketing, Sun India, 2020.
4.	Digital Marketing Essentials you always wanted to know, Vibrant Publishers, 2020

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3207	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DEVOPS

(for CSBS)

Course Objectives: Students are expected to learn

1.	To describe the agile relationship between development and IT operations
2.	To understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability
3.	To implement automated system update and DevOps lifecycle

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

S.No	Outcome	Knowledge Level
1.	**Identify** components of Devops environment	K2
2.	**Describe** Software development models and architectures of DevOps	K2
3.	**Apply** different project management, integration, testing and code deployment tool	K3
4.	**Investigate** different DevOps Software development models.	K3
5.	**Assess, Collaborate** and **adopt** various Devops in real-time projects	K3

SYLLABUS

UNIT-I (10Hrs)	**Introduction to DevOps:** Introduction to SDLC, Agile Model. Introduction to Devops. DevOps Features, DevOps Architecture, DevOps Lifecycle, Understanding Workflow and principles, Introduction to DevOps tools, Build Automation, Delivery Automation, Understanding Code Quality, Automation of CI/ CD. Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples
UNIT-II (10 Hrs)	**Source Code Management (GIT):** The need for source code control, The history of source code management, Roles and code, source code management system and migrations. What is Version Control and GIT, GIT Installation, GIT features, GIT workflow, working with remote repository, GIT commands, GIT branching, GIT staging and collaboration. UNIT TESTING - CODE COVERAGE: Junit, nUnit & Code Coverage with Sonar Qube, SonarQube - Code Quality Analysis.
UNIT-III (10 Hrs)	**Build Automation - Continuous Integration (CI):** Build Automation, What is CI Why Cl is Required, CI tools, Introduction to Jenkins (With Architecture), jenkins workflow, jenkins master slave architecture, Jenkins Pipelines, PIPELINE BASICS - Jenkins Master, Node, Agent, and Executor Freestyle Projects & Pipelines, Jenkins for Continuous Integration, Create and Manage Builds, User Management in Jenkins Schedule Builds, Launch Builds on Slave Nodes.

UNIT-IV (10 Hrs)	**Continuous Delivery (CD):** Importance of Continuous Delivery, CONTINUOUS DEPLOYMENT CD Flow, Containerization with Docker: Introduction to Docker, Docker installation, Docker commands, Images & Containers, DockerFile, Running containers, Working with containers and publish to Docker Hub. **Testing Tools:** Introduction to Selenium and its features, JavaScript testing
UNIT-V (10 Hrs)	**Configuration Management - ANSIBLE:** Introduction to Ansible, Ansible tasks, Roles, Jinja templating, Vaults, Deployments using Ansible. CONTAINERIZATION USING KUBERNETES(OPENSHIFT): Introduction to Kubernetes Namespace & Resources, CI/CD - On OCP, BC, DC & ConfigMaps, Deploying Apps on Openshift Container Pods. Introduction to Puppet master and Chef.

Textbooks:	
1.	Joyner, Joseph., Devops for Beginners: Devops Software Development Method Guide for Software Developers and It Professionals, 1st Edition Mihails Konoplows, 2015.
2.	Alisson Machado de Menezes., Hands-on DevOps with Linux,1st Edition, BPB Publications, India, 2021.
Reference Books:	
1.	Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10
2.	Gene Kim Je Humble, Patrick Debois, John Willis. The DevOps Handbook, 1st Edition, IT Revolution Press, 2016.
3.	Verona, Joakim Practical DevOps, 1st Edition, Packt Publishing, 2016.
4.	Joakim Verona. Practical Devops, Ingram short title; 2nd edition (2018). ISBN10: 1788392574
5.	Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3209	PE	3	--	--	3	30	70	3 Hrs.

SOFTWARE PROJECT MANAGEMENT

(For CSBS)

Course Objectives: Students are expected to learn

1.	Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
2.	Compare and differentiate organization structures and project structures
3.	Implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

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

S.No	Outcome	Knowledge Level
1.	**Apply** the process to be followed in the software development life-cycle models	K3
2.	**Apply** the concepts of project management & planning	K3
3.	**Implement** the project plans through managing people, communications and change	K3
4.	**Conduct** activities necessary to successfully complete and close the Software projects	K3
5.	**Implement** communication, modeling, and construction & deployment practices in software development	K3

SYLLABUS

UNIT-I (10Hrs)	**Conventional Software Management:** The waterfall model, conventional software Management performance. **Evolution of Software Economics:** Software Economics, pragmatic software cost estimation. **Improving Software Economics:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections. **The old way and the new:** The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.
UNIT-II (10 Hrs)	**Life cycle phases:** Engineering and production stages, inception, Elaboration, construction, transition phases. **Artifacts of the process:** The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.
UNIT-III	**Model based software architectures:** A Management perspective and technical

(10 Hrs)	perspective. **Work Flows of the process:** Software process workflows, Iteration workflows. **Checkpoints of the process: Major** mile stones, Minor Milestones, Periodic status assessments. **Iterative Process Planning:** Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.
UNIT-IV (10 Hrs)	**Project Organizations and Responsibilities:** Line-of-Business Organizations, Project, Organizations, evolution of Organizations. **Process Automation:** Automation Building blocks, The Project Environment. **Project Control and Process instrumentation:** The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation
UNIT-V (10 Hrs)	Agile Methodology, ADAPTing to Scrum, Patterns for Adopting Scrum, Iterating towards Agility. **Fundamentals of DevOps**: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps ecosystem. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

Textbooks:	
1.	Software Project Management, Walker Royce, PEA, 2005.
2.	Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.
Reference Books:	
1.	Software Project Management, Bob Hughes,3/e, Mike Cotterell, TMH
2.	Software Project Management, Joel Henry, PEA
3.	Software Project Management in practice, PankajJalote, PEA, 2005,
4.	Project Management in IT, Kathy Schwalbe, Cengage
5.	The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.
E-Resources	
1.	https://onlinecourses.nptel.ac.in/noc19_cs70/preview
2.	https://www.javatpoint.com/software-project-management

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3210	PE	3	--	--	3	30	70	3 Hrs.

ADHOC AND SENSOR NETWORKS

(for CSBS)

Course Objectives: Students are expected to learn

1.	Architect sensor networks for various application setups.
2.	Devise appropriate data dissemination protocols and model links cost.
3.	Understanding of the fundamental concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers
4.	Evaluate the performance of sensor networks and identify bottlenecks.

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

S.No	Outcome	Knowledge Level
1.	**Discuss** the characteristics, applications, and challenges of MANETs and design of MAC protocols.	K2
2.	**Demonstrate** the application of different routing protocols in various ad- hoc network topologies and scenarios.	K3
3.	**Explain** the different secure routing protocols used to protect against attacks in ad hoc networks.	K2
4.	**Demonstrate the** effects of different factors on the sensing and communication range by applying them to real-world scenarios.	K3
5.	**Describe** the key management techniques used in WSNs and their role in securing communication in the network.	K2

SYLLABUS

UNIT-I (10Hrs)	**Introduction to Ad Hoc Wireless Networks-** Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet, MAC protocols for Ad hoc Wireless Networks-Issues, Design Goals and Classifications of the MAC Protocols.
UNIT-II (10 Hrs)	**Routing Protocols for Ad Hoc Wireless Networks-** Issues in Designing a Routing Protocol, Classifications of Routing Protocols, Topology-based versus Position-based Approaches, Issues and design goals of a Transport layer protocol, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Solutions for TCP over Ad Hoc Wireless Networks, Other Transport layer protocols.
UNIT-III (10 Hrs)	**Security protocols for Ad hoc Wireless Networks-** Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc

	Wireless Networks, Cooperation in MANETs, Intrusion Detection Systems.
UNIT-IV (10 Hrs)	**Basics of Wireless Sensors and Applications-** The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.
UNIT-V (10 Hrs)	**Security in WSNs-** Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote. **Sensor Network Operating Systems–**TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language-nesC. **Dataflow Style Language-**TinyGALS, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.

Textbooks:	
1.	C. Siva Ram Murthy and B.S. Manoj, Ad Hoc Wireless Networks: Architectures and Protocols, Pearson Education.
2.	Ad Hoc and Sensor Networks – Theory and Applications, 2nd edition Carlos Corderio Dharma P.Aggarwal,World Scientific Publications / Cambridge University Press, March
Reference Books:	
1.	Wireless Sensor Networks: An Information Processing Approach, 1st edition,Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp2009
2.	Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, 1st edition, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008
3.	Ad hoc Networking, 1st edition,*Charles E.Perkins*, Pearson Education, 2001
4.	Wireless Ad hoc Networking, 1st edition, *Shih-Lin Wu, Yu-Chee Tseng,* Auerbach Publications, Taylor & Francis Group, 2007
5.	Wireless Sensor Networks – Principles and Practice, 1st edition, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010
E-Resources	
1.	https://archive.nptel.ac.in/courses/106/105/106105160/

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3211	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

NATURAL LANGUAGE PROCESSING

(for CSBS)

Course Objectives: Students are expected to learn

1.	This course introduces the fundamental concepts and techniques of natural language processing (NLP).
2.	Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
3.	The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
4.	Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

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

S.No	Outcome	Knowledge Level
1.	**Demonstrate** a given text with basic Language features	K2
2.	**Apply** an innovative application using NLP components	K3
3.	**Explain** a rule-based system to tackle morphology/syntax of a language	K2
4.	**Design** a tag set to be used for statistical processing for real-time applications	K3
5.	**Classify** different statistical approaches for different types of NLP applications.	K3

SYLLABUS

UNIT-I (10Hrs)	**Introduction:** Origins and challenges of NLP, Language Modeling: Grammar-based LM, Statistical LM, Regular Expressions, Finite-State Automata, English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.
UNIT-II (10 Hrs)	**Word Level Analysis:** Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging, Hidden Markov and Maximum Entropy models.
UNIT-III (10 Hrs)	**Syntactic Analysis:** Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar, Dependency Grammar, Syntactic Parsing, Ambiguity, Dynamic Programming parsing, Shallow parsing, Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs, Feature structures, Unification of feature structures

UNIT-IV (10 Hrs)	**Semantics And Pragmatics:** Requirements for representation, First-Order Logic, Description Logics, Syntax-Driven Semantic analysis, Semantic attachments, Word Senses, Relations between Senses, Thematic Roles, selectional restrictions, Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods, Word Similarity using Thesaurus and Distributional methods.
UNIT-V (10 Hrs)	**Discourse Analysis and Lexical Resources:** Discourse segmentation, Coherence, Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm, Coreference Resolution, Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).
Textbooks:	
1.	Daniel Jurafsky, James H. Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2.	Steven Bird, Ewan Klein and Edward Loper, Natural Language Processing with Python, First Edition, OReilly Media, 2009.
Reference Books:	
1.	Breck Baldwin, Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2.	Richard M Reese, Natural Language Processing with Java, OReilly Media, 2015.
E-Resources	
1.	https://nptel.ac.in/courses/106105158
2.	https://sites.google.com/view/nlp-cs60075/course-materials
3.	https://intellipaat.com/blog/what-is-natural-language-processing/

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3212	**PE**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

FINANCIAL ANALYTICS

(for CSBS)

Course Objectives: Students are expected to learn

1.	This course introduces a core set of modern analytical tools that specifically target finance applications.

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

S.No	Outcome	Knowledge Level
1.	**Summarize** the basic concepts of financial data analytics.	K3
2.	**Apply** time series and financial statement analysis to draw inferences on corporate performance.	K3
3.	**Apply** models for assessing financial volatility and evaluate credit risk	K3
4.	**Apply** portfolio theory to construct optimal portfolios.	K3

SYLLABUS

UNIT-I (10Hrs)	**Corporate finance analysis:** Basic corporate financial predictive modeling- Project analysis- cash flow analysis- cost of capital using sensitivity analysis, Indifference point and Financial Break even modeling, Capital Budget model-Payback, NPV, IRR, and MIRR. Bankruptcy Modeling Beavert test, Ohison logistic regression and Alt man Z score
UNIT-II (10 Hrs)	**Financial market analysis:** Estimation and prediction of risk and return (bond investment and stock investment) – adjusting for stock splits, adjusting for mergers, plotting multiple series, data importing from web portal and data cleansing. Time series- examining nature of data, EWMOA, Value at risk, ARMA, ARCH and GARCH.
UNIT-III (10 Hrs)	**Portfolio analysis:** Portfolio Analysis – capital asset pricing model, Sharpe ratio, Markowitz's mean variance optimization model and cluster analysis for categorisation of portfolio. Option pricing models- binomial model for options, Black Scholes model and Option implied volatility.
UNIT-IV (10 Hrs)	**Technical analysis:** Prediction using chart and fundamentals – RSI, ROC, MACD, moving average and candle charts, simulating trading strategies. Prediction of share prices using machine learning-ANN and SVM.
UNIT-V	**Corporate finance analysis:** Basic corporate financial predictive modeling- Project

(10 Hrs)	analysis- cash flow analysis- cost of capital using sensitivity analysis, Indifference point and Financial Break even modeling, Capital Budget model-Payback, NPV, IRR, and MIRR. Bankruptcy Modeling Beavert test, Ohison logistic regression and Alt man Z score
Textbooks:	
1.	Financial analytics with R by Mark J. Bennett, Dirk L. Hugen, Cambridge university press.
2.	Haskell Financial Data Modeling and Predictive Analytics Paperback – Import, 25 Oct 2013 by Pavel Ryzhov.
Reference Books:	
1.	Python for Finance - Paperback – Import, 30 Jun 2017 by Yuxing Yan (Author).
2.	5. Mastering Python for Finance Paperback – Import, 29 Apr 2015 by James Ma Weiming.
3.	Quantitative Financial Analytics: The Path To Investment Profits Paperback – Import, 11 Sep 2017 by Edward E Williams (Author), John A Dobelman

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3214	**PC**	**--**	**--**	**3**	**1.5**	**30**	**70**	**3 Hrs.**

BUSINESS INTELLIGENCE AND MACHINE LEARNING LAB

(for CSBS)

Course Objectives: Students are expected to learn

1	To introduce Business Intelligence tools and techniques for effective decision-making using real-time data.
2	To enable students to perform data cleaning, transformation, modeling, and visualization using Power BI and Python.
3	To implement core data mining algorithms and interpret their business impact.
4	To integrate machine learning techniques for forecasting and intelligent analysis in BI applications.
5	To design and deliver complete end-to-end BI solutions using real or simulated institutional/business datasets.

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

S.No	Outcome	Knowledge Level
1	**Apply** BI tools to clean, transform, and prepare data for analysis.	K3
2	**Design** and **build** dashboards with appropriate KPIs for decision-making.	K4
3	**Apply** core data mining and machine learning algorithms for business-driven predictions.	K3
4	**Integrate** and **visualize** mined or predicted insights using Power BI or Tableau.	K4
5	**Design**, **document**, and **present** full-cycle BI solutions for real-world business scenarios.	K4

SYLLABUS

1	Install Power BI Desktop and create a basic report with visuals using sales or music dataset.
2	Use Power Query Editor to clean missing values, transform columns, and establish relationships.
3	Build dashboards using slicers, cards, charts, and drill-through for KPIs (sales, profit, region).
4	Connect a real-time data source (e.g., COVID-19, weather) and visualize updates in Power BI.
5	Use the Apriori algorithm to identify product associations from retail datasets.
6	Apply k-Means clustering to group customers based on purchase behavior or region.
7	Use decision trees to classify loan approvals using historical data.
8	Import mining output into Power BI or Tableau and visualize clusters/rules.
9	Predict future sales using historical data with regression analysis.
10	Identify customers likely to churn based on activity data.
11	Product Review Sentiment Analysis for Business Insights
12	Apply Principal Component Analysis to reduce data complexity.

13	Build a basic recommendation system using collaborative filtering.
14	**Project 1:** To build a Business Intelligence solution for an SRKR-based retail/e-commerce portal to analyze real-time order tracking, customer behavior, and sales performance.
15	**Project 2:** To design and implement a complete Business Intelligence system to manage, analyze, and visualize departmental budgeting, spending, and forecasting data at SRKR Engineering College students using real or simulated datasets.
Text Books:	
1	Cindi Howson, Successful Business Intelligence, McGraw-Hill Education. (https://www.pdfdrive.com/successful-business-intelligence-second-edition-e60360818.html)
2	Business Intelligence: A Managerial Perspective on Analytics, by Ramesh Sharda & Dursun Delen & Efraim Turban https://www.pdfdrive.com/business-intelligence-a-managerial-perspective-on-analytics-e180541229.html
Reference Books:	
1	Data Mining: Concepts and Techniques, Second Edition (The Morgan Kaufmann Series in Data by Jiawei Han & Micheline Kamber & Jian Pei https://www.pdfdrive.com/data-mining-concepts-and-techniques-second-edition-the-morgan-kaufmann-series-in-data-management-systems-e157156126.html
2	Machine Learning: A Guide to Current Research, by Tom M. Mitchell & Jaime G. Carbonell https://www.pdfdrive.com/machine-learning-a-guide-to-current-research-e157503508.html
Web Links:	
1	https://www.microsoft.com/en-in/power-platform/products/power-bi
2	https://www.tableau.com/learn/training
3	https://github.com/datasets – (Datasets for Practice)

Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23CB3215	**PC**	**--**	**--**	**3**	**1.5**	**30**	**70**	**3 Hrs.**

CLOUD COMPUTING LAB

(for CSBS)

Course Objectives: Students are expected to learn

1	To introduce the various levels of services offered by cloud
2	To give practical knowledge about working with virtualization and containers
3	To introduce advanced concepts such as serverless computing and cloud simulation

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

S.No	Outcome	Knowledge Level
1	**Demonstrate** various service types, delivery models and technologies of a cloud computing environment.	K3
2	**Distinguish** the services based on virtual machines and containers in the cloud offerings.	K4
3	**Assess** the challenges associated with a cloud-based application.	K3
4	**Discuss** advanced cloud concepts such as serverless computing and cloud simulation.	K4
5	**Examine** various programming paradigms suitable to solve real world and scientific problems using cloud services	K4

SYLLABUS

1	Build your VPC and lunch a web server.
2	AWS Lambda and Elastic beanstalk.
3	Exploring AWS Identity and Access Management (IAM).
4	Creating an Amazon RDS Database Creating an Amazon RDS Database.
5	Creating a Virtual Private Cloud Creating a Virtual Private Cloud.
6	Creating a Highly Available Environment.
7	Securing Applications by using Amazon Cognito.
8	Encrypting Data at Rest by Using AWS Encryption Options.
9	Automating Infrastructure with AWS CloudFormation.
10	Building Decoupled Applications by Using Amazon SQS.
11	Implementing a Serverless Architecture on AWS.
12	Configuring Hybrid Storage and Migrating Data with AWS Storage Gateway S3 File Gateway.
13	Creating a Static Website for the Café
14	Migrating a Database to Amazon RDS.Creating a Static Website for the Café.

Text Books:	
1	Mastering Cloud Computing, 2nd edition, Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, Shivananda Poojara, Satish N. Srirama, McGraw Hill, 2024
2	*Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012*
Reference Books:	
1	Cloud Computing, Theory and Practice, Dan C Marinescu, 2nd edition, MK Elsevier, 2018
2	Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
3	Online documentation and tutorials from cloud service providers (e.g. AWS, Google App Engine).
4	Docker, Reference documentation, https://docs.docker.com/reference/
5	OpenFaaS, Serverless Functions Made Simple, https://docs.openfaas.com/
Web Links:	
1	https://www.microsoft.com/en-in/power-platform/products/power-bi
2	https://www.tableau.com/learn/training
3	https://github.com/datasets – (Datasets for Practice)

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23BS3201	SEC	--	1	2	2	30	70	3 Hrs.

SOFT SKILLS

(For AIML, CSBS, CSE, IT and MECH)

Course Objectives:

1	To familiarise students with soft skills and how they influence their professional growth.
2	To build/refine the professional qualities/skills necessary for a productive career and to instill confidence through attitude building.

Course Outcomes:

S.No	Outcome	Knowledge Level
1	Interpret the essence of key soft skills such as creativity & problem solving, emotional intelligence, leadership qualities, etc.	K2
2	Outline interview essentials for graduate-job prospects.	K2
3	Apply presentation skills in academic and professional settings.	K3
4	Demonstrate knowledge about domain specific industry and the prospective workplace.	K2

SYLLABUS

1	**INTRODUCTION** Introduction to soft skills, definition and meaning, importance and need in personal and professional settings; soft skills vs. hard skills; personality development.
2	**INTRA-PERSONAL AND INTER-PERSONAL COMMUNICATION** Significance of Inter & Intra-Personal Communication; SWOT Analysis; Goal Setting – Guidelines for Goal Setting; Emotional Intelligence; Creativity & Problem Solving; Stress and Time Management; Leadership & Team Work; Building a positive attitude, Social Consciousness.
3	**WRITTEN COMMUNICATION** Resume Preparation: Common resume blunders, Tips for betterment, Resume Review; Report Writing; Writing an SOP (Statement of purpose).
4	**PRESENTATION SKILLS** Importance of Presentation Skills; JAM; Essential guidelines for Group Discussions; Debates; Role Plays; PPTs etc.
5	**INTERVIEW SKILLS** Employability Skills: Knowing about Selection Process; Interview Skills, types of Interviews, E-Interviews, Do's and Don'ts of Interviews, FAQs, Mock Interviews; Awareness about Industries; Importance of researching the prospective workplace.

Text Books:

1	Sherfield, M. Robert et al, Cornerstone Developing Soft Skills,(4th edition), Pearson Publication, New Delhi, 2014.
2	Alka Wadkar, Life Skills for Success,(1st edition), Sage Publications India Private Limited, 2016.
3	Soft Skills : Know Yourself and Know the World by Dr. K. Alex, S. Chand & Company Ltd., New Delhi, 2009.
Reference Books:	
1	Sambaiah.M. Technical English, Wiley Publishers India. New Delhi. 2014.
2	Gangadhar Joshi, From Campus to Corporate, SAGE TEXT, 2015.
3	Alex.K, Soft Skills, 3rd ed. S. Chand Publication, New Delhi, 2014.
4	Meenakshi Raman and Sangeeta Sharma, Technical Communication: Principle and Practice, Oxford University Press, 2009.
5	Emotional Intelligence by Daniel Goleman, Random House Publishing Group, 2012.

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23AC3201	AC	2	--	--	--	30	--	3 Hrs.

TECHNICAL PAPER WRITING & IPR

(Common to AI&DS, CSE, AIML, CSIT, IT, CSD, CSBS, CIC, CE, ME)

Course Objectives:

1.	To appreciate the difference in English used in Academic, Business, Legal and other contexts.
2.	To know the fundamentals of basic technical report structure and writing.
3.	To understand the filing and processing of patent application.

Course Outcomes

S.No	Outcome	Knowledge Level
1.	Construct grammatically sound and concise technical write-ups.	K3
2.	Prepare the outline and structure of a technical paper with essential sections.	K3
3.	Develop a project proposal and dissertation framework aligned with academic conventions.	K3
4.	Use a word processor effectively for document formatting, citations, and version control.	K3
5.	Identify appropriate IPR mechanisms for protecting various types of intellectual creations.	K3

SYLLABUS

UNIT-I (10Hrs)	**Introduction:** An introduction to writing technical reports, technical sentences formation, using transitions to join sentences, Using tenses for technical writing. **Planning and Structuring:** Planning the report, identifying reader(s), Voice, Formatting and structuring the report, Sections of a technical report, Minutes of meeting writing.
UNIT-II (10 Hrs)	**Drafting report and design issues:** The use of drafts, Illustrations and graphics. **Final edits:** Grammar, spelling, readability and writing in plain English: Writing in plain English, Jargon and final layout issues, Spelling, punctuation and Grammar, Padding, Paragraphs, Ambiguity.
UNIT-III (10 Hrs)	**Proofreading and summaries:** Proofreading, summaries, Activities on summaries. **Presenting final reports:** Printed presentation, Verbal presentation skills, Introduction to proposals and practice.
UNIT-IV (10 Hrs)	**Using word processor:** Adding a Table of Contents, Updating the Table of Contents, Deleting the Table of Contents, Adding an Index, Creating an Outline, Adding Comments, Tracking Changes, Viewing Changes, Additions, and Comments, Accepting and Rejecting Changes, Working with Footnotes and Endnotes, Inserting citations and Bibliography,

	Comparing Documents, Combining Documents, Mark documents final and make them read only., Password protect Microsoft Word documents., Using Macros
UNIT-V (10 Hrs)	**Nature of Intellectual Property:** Patents, Designs, Trade and Copyright. Process of **Patenting and Development:** technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property
Textbooks:	
1.	Kompal Bansal &Parshit Bansal, "Fundamentals of IPR for Beginner's", 1st Ed., BS Publications, 2016.
2.	William S. Pfeiffer and Kaye A. Adkins, "Technical Communication: A Practical Approach", Pearson.
Reference Books:	
1.	Ramappa,T., "Intellectual Property Rights Under WTO", 2nd Ed., S Chand, 2015.
2.	Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.
3.	Day R, How to Write and Publish a Scientific Paper, Cambridge University Press(2006)
e-Resources	
1.	https://www.udemy.com/course/reportwriting/
2.	https://www.udemy.com/course/professional-business-english-and-technical-report-writing/
3.	https://www.udemy.com/course/betterbusinesswriting/