MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belagavi)

Autonomous Programme

Bachelor of Engineering

Department Of
COMPUTER SCIENCE AND BUSINESS SYSTEM

SCHEME and SYLLABUS

(2022 Admitted Batch)

Academic Year 2025-2026

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF COMPUTER SCIENCE AND

VISION OF THE INSTITUTE

To be an institute of excellence in engineering education and research, producing socially responsible professionals.

MISSION OF THE INSTITUTE

1. Create conducive environment for learning and research
2. Establish industry and academia collaborations
3. Ensure professional and ethical values in all institutional endeavors

VISION OF THE DEPARTMENT

Emerge as an industry focused centre for promoting innovation, entrepreneurship, research and best practices of computer science together with managerial skills to serve the society and industry.

MISSION OF THE DEPARTMENT

1. Impart globally connected cutting-edge technologies and business skills
2. Enhance industrial experience, promote entrepreneurship and research through industry institute interaction
3. Implement best practices to enrich knowledge and skill sets
4. Produce competent professionals with societal and environmental concern

MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF COMPUTER SCIENCE AND

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Explore and excel in emerging domains of computer science and business systems.

PEO2: Develop professional skills that equip employability and higher education in the contemporary areas of Computer Science and Business Systems.

PEO3: Empower Research Skills by designing and developing solutions in the field of IT and facilitate to take up higher studies.

PEO4: Impart industry ready business skills through collaborations to bridge the gap between industry and academics.

PROGRAM OUTCOMES (POs)

1. **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct Investigations of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities withan understanding of the limitations.
6. **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PROGRAM OUTCOMES (POs)

7. **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long Learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO1: Develop efficient computer based systems to solve real life problems.

PSO2: Implement new generation technologies to design and develop industry relevant projects.

Scheme of Evaluation (Theory Courses)

Assessment	Marks
CIE 1	**10**
CIE 2	**10**
CIE 3	**10**
Activities as decided by course faculty	**20**
SEE	**50**
Total	**100**

Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Continuous Evaluation in every lab session by the Course Coordinator	**10**
Record Writing	**20**
Laboratory CIE conducted by the Course Coordinator	**20**
SEE	**50**
Total	**100**

Examination	Maximum Marks	Minimum marks to Qualify
CIE	50	20
SEE	50	20

MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

COURSE TYPES

Basic Science Course	BSC
Engineering Science Course	ESC
Emerging Technology Course	ETC
Programming Language Course	PLC
Professional Core Course	PCC
Integrated Professional Core Course	IPCC
Professional Core Course Laboratory	PCCL
Professional Elective Course	PEC
Open Elective Course	OEC
Project/Mini Project/Internship	PI
Humanities and Social Sciences, Management Course	HSMC
Ability Enhancement Course	AEC
Skill Enhancement Course	SEC
Universal Human Value Course	UHV
Non-credit Mandatory Course	MC

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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

2022 - 2023 Admitted Batch

SEVENTH SEMESTER											
Sl. No	**Course Category**	**Course Code**	**Course Title**	**Teaching Hours/Week**				**Exam Marks**			**Credits**
				L	**T**	**P**	**Total**	**CIE**	**SEE**	**Total**	
1	PCC	22CB701	Business Intelligence	3	0	0	3	50	50	100	3
2	IPCC	22CB702	Computer Graphics and Visualization	3	0	2	5	50	50	100	4
3	PCCL	22CB703	Business Intelligence and Data Analytics Laboratory	0	1	2	3	50	50	100	2
4	PI	22CB704	Main Project Phase II	0	0	8	8	50	50	100	4
5	PEC	22CB77x	Professional Elective Course - III	3	0	0	3	50	50	100	3
6	OEC	22OECB7X	Open Elective Course – II	3	0	0	3	50	50	100	3
			Total				25				19

Professional Elective Course - III	
Course Code	**Course Name**
22CB771	Software Testing and Quality Assurance
22CB772	Big Data Analytics
22CB773	Advanced JAVA
22CB774	Deep Learning

Open Elective Course - II	
Course Code	**Course Name**
22OECB71	Business Management
22OECB72	AI for Business and Finance
22OECB73	Entrepreneurship and Business Development
22OECB74	Human-Computer Interaction (HCI)

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EIGHTH SEMESTER											
Sl. No	**Course Category**	**Course Code**	**Course Title**	**Teaching Hours/Week**				**Exam Marks**			**Credits**
				L	**T**	**P**	**Total**	**CIE**	**SEE**	**Total**	
1	PEC	22SW02	Swayam (Online 12 weeks Course through NPTEL)	3	0	0	-	50	50	100	3
2	OEC	22SW02	Swayam (Online 12 weeks Course through NPTEL)	3	0	0	-	50	50	100	3
3	PI	22INT	Internship (Research/Industry) (14-20 weeks)	0	0	20	20	100	100	200	10
			Total				20				**16**

MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

Course Title	**BUSINESS INTELLIGENCE**		
Course Code	**22CB701**	**L-T-P-C**	**(3-0-0)3**
Exam Hrs.	**3**	**Hours / Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: To apply analytics and optimization techniques for data-driven decision-making, using AI, text mining, and ethical data practices.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Evaluate the role of Business Intelligence and Decision Support Systems in organizations.	1,2	-
2.	Design real-time analytics and stream processing in business applications.	2,3	1
3.	Construct prescriptive analytics techniques and optimization models for decision-making.	2,4	-
4.	Analyse text, social, and web analytics and address ethical aspects of analytics solutions.	5,6,7	2

Course Contents:

Module 1	**10 Hours**

Fundamentals of Business Intelligence: Changing business environments and evolving needs for decision support and analytics, decision-making processes and computerized decision support framework, evolution of computerized decision support to analytics, framework for business intelligence, analytics examples.

Module 2	**10 Hours**

AI and Robots in Business applications

Overview of AI in business applications, Human and computer intelligence, Major AI technologies and its derivatives, AI support for decision making, AI applications in various Business Functions, introduction to robotics, applications of robots, Conversational AI- chatbots, chatbot evolution, components of chatbots and the process of their use, drivers and benefits, enterprise chatbots, financial services, service industries, chatbot platforms, knowledge for enterprise chatbots, virtual personal assistants.

Module 3	**10 Hours**

Collaborative systems and AI support

Making decision in groups, team collaboration with computerized systems, electronic support for group communication and collaboration.

Descriptive Analytics

Nature of data in analytics, taxonomy of data, art and science of data processing, BI and data warehousing, Business Reporting, Data Visualization, different types of charts and graphs, emergence of visual analytics, information dashboards, dashboard design.

Module 4	**10 Hours**

Prescriptive Analytics

Model-based decision making, structure of mathematical models for decision support, certainty, uncertainty and risk, decision modeling with spreadsheet, mathematical programming

optimization, multiple goals, sensitivity analysis, what-if analysis and goal seeking, decision analysis with decision tables and decision trees, introduction to simulation, visual interactive simulation, genetic algorithms and developing GA applications.

Text Books:

1. Business Intelligence, Analytics, Data Science and AI, Ramesh Sharda, Dursun Delen, Efraim Turban 5th Edition Pearson Publisher Year 2024
2. Analytics, Data Science and AI systems for decision support, Ramesh Sharda, Dursun Delen, Efraim Turban 11th Edition Pearson Publisher Year 2021

Reference Books:

1. Business Intelligence Strategy and Big Data Analytics, Steve Williams, Morgan Kaufmann, 2016
2. Data Analytics and Business Intelligence, Vincent Charles et al, CRC Press, 2023
3. Data Analytics for Business: Lessons for Strategy**,** Ira J. Haimowitz, Routledge, 2023

Online Courses and Video Lectures:

1. https://www.tableau.com/business-intelligence/what-is-business-intelligence
2. https://cloud.google.com/learn/what-is-business-intelligence
3. https://www.geeksforgeeks.org/what-is-data-analytics/
4. https://onlinecourses.nptel.ac.in/noc24_cs65/preview

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	2	-	-	-	-	-	-	-	-	-	2	-
CO3	-	3	-	2	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	2	2	-	-	-	-	-	-	2

MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

Course Title	**COMPUTER GRAPHICS AND VISUALIZATION**		
Course Code	**22CB702**	**L-T-P-C**	**(3-0-2)4**
Exam Hrs.	**3**	**Hours / Week**	**5**
SEE	**50 Marks**	**Total Hours**	**40L + 12P**

Course Objective: To introduce students to basic computer graphics concepts and visualization using OpenGL and geometric transformations.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	**Course Outcomes**	**Mapping to POs**	**Mapping to PSOs**
1.	Describe core concepts of computer graphics with OpenGL	1,2	-
2.	Apply concepts of geometric transformations, projections, and illumination to render image..	2,3	-
3.	Analyze line clipping and polygonal clipping algorithms	2,4	-
4.	Design a 2D/3D image using graphical concepts through OpenGL	2,3,4,5	2

Course Contents:

Module 1	**10 Hours**
Introduction: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; The synthetic camera model; The programmer's interface: Pen Plotter Model, Graphics architectures; Graphics Programming: The Sierpinski gasket; Programming two - dimensional applications. The OpenGL: The OpenGL API; Primitives and attributes;	
Module 2	**10 Hours**
The OpenGL (Continued): Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three-dimensional gasket. Input and Interaction: Interaction; Input devices; Clients and Servers; Display lists; Display listsand modeling; Programming event-driven input; Menus, Animating interactive programs.	
Module 3	**10 Hours**
Geometric Objects and Transformations: Scalars, points, and vectors; Three-dimensional primitives; Coordinate systems and frames; Frames in OpenGl; Modeling a colored cube; Affine transformations; Rotation, translation and scaling; Transformations in homogeneous coordinates; Concatenation of transformations; OpenGL transformation matrices	
Module 4	**10 Hours**
Viewing: Classical and computer viewing; Viewing with a computer; Positioning of the camera Positioning of the Camera Frame; Simple projections; Projections in OpenGL; Hidden-Surface Removal, Lighting and Shading: Light and Matter; Light Sources; The Phong Lighting Model; Polygonal Shading; Light sources in OpenGL; Specification of materials in OpenGL Implementation: Clipping; Line- Segment Clipping; Bresenham's Algorithm	

Practical Components
Write C program using OpenGL functions to 1. Recursively subdivide a tetrahedron to from 3D Sierpinski gasket. The number of recursive steps is to be specified by the user.

2. Draw a Rocket and allow the user to change the color.
3. Create robot face using display list.
4. Generate square for right click and to exit for left click using mouse function.
5. Draw box at each location on the screen where the mouse cursor is located.
6. Create hierarchical menus.
7. Create a house like figure and rotate it about a given fixed point using OpenGL functions.
8. Create a Rotating Square.
9. Draw a color cube and spin it using OpenGL transformation matrices.
10. Clip the line segment A(-4,2) and B(-1,7) in a window defined by left bottom corner at (-3,1) and upper right corner at (2,6). Find the visible portion of the line segment using Cohen Sutherland line clipping algorithm

Text Books:

1. Interactive Computer Graphics A Top-Down Approach with OpenGL Edward Angel 5 th Addison-Wesley 2013

Reference Books:

1. Computer Graphics Using OpenGL F.S. Hill,Jr, 2 nd Pearson education 2011
2. Computer Graphics James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes 1 st Addison-wesley.

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	2	-	-	-	-	-	-	-	-	-	-
CO4	-	3	2	2	2	-	-	-	-	-	-	-	-	2

MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

Course Title	**BUSINESS INTELLIGENCE AND DATA ANALYTICS LABORATORY**		
Course Code	**22CB703**	**L-T-P-C**	**(0-1-2) 2**
Exam Hrs.	**3**	**Hours / Week**	**4**
SEE	**50 Marks**	**Total Hours**	**12T + 12P**

Course Objective: To apply analytics, machine learning, and visualization for predictive modeling in finance, commodities, and socio-political domains.
Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Build and evaluate BI dashboards and real-time visualizations using industry tools like Power BI, Excel, and Spark.	4,5	-
2.	Apply machine learning and optimization models through lab-based scenarios using Python and simulation tools.	3,5	2

List of Experiments

1. Perform exploratory data analysis (EDA) and feature engineering on the Titanic dataset using Jupyter Notebook and Python to identify key patterns and prepare the data for machine learning.
2. Build an interactive sales dashboard using Apache Superset by connecting to a PostgreSQL database populated with the Superstore dataset.
3. Develop a customer churn prediction model using the Telco Customer Churn dataset and evaluate performance using Random Forest and XGBoost algorithms.
4. Build a recommendation system using collaborative filtering on the MovieLens dataset to suggest movies based on user preferences.
5. Perform sentiment analysis on Amazon product reviews by scraping live data using BeautifulSoup or Selenium, or use the Amazon Product Reviews dataset for analysis with TextBlob or VADER.
6. Forecast future product sales using Facebook Prophet on the Walmart Store Sales dataset and evaluate the seasonal trends.
7. Use DBSCAN and PCA techniques to perform customer segmentation on the E-Commerce Customer dataset.
8. Create a business dashboard using Streamlit or Plotly Dash to visualize HR analytics data from the IBM HR Analytics dataset, including attrition and salary bands.
9. Analyze large-scale taxi trip data using PySpark in a Jupyter Notebook on Google Colab with the NYC Taxi Trip Data to identify patterns and trends.
10. Develop and containerize a Flask web app using Docker that visualizes live stock market data using the Yahoo Finance API (yfinance).

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	3	2	-	-	-	-	-	-	-	-
CO2	-	-	3	-	2	-	-	-	-	-	-	-	3

MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

MAIN PROJECT PHASE - II			
Course Code	**22CB704**	**L-T-P-C**	**(0-0-8) 4**
Exam Hrs.	**3**	**Hours / Week**	**8**
SEE	**50 Marks**	**Total Hours**	**-**

Course Objective: Design and implement solution for the identified real world problem.
Course Outcomes (COs): Upon completion of course the students will be able to

	Course Outcomes	**Mapping to POs**	**Mapping to PSOs**
1.	Implement the design with appropriate techniques, resources and contemporary tools	3,5	1,2
2.	Communicate effectively with team members and mentors, make presentations and prepare technical document	9,10,11	2
3.	Use ethical practices in all endeavors	8	-
4.	Share the responsibilities for carrying out the project & playing individual roles appropriately	9	-
5.	Implement the design with appropriate techniques, resources and contemporary tools	3,5	1,2

The project teams will implement the project started in their seventh semester

The project work is to be evaluated in three stages:

Stage I (30M) - First internal evaluation shall be taken up during this phase. This includes presentation on fine tuning of SRS & Design carried out in seventh semester.

Stage II (20 M) – Mid phase evaluation shall be taken up during this phase. This includes presentation, intermediate project demonstration, draft copy of the paper

Stage III (50 M) – Final project Demo, report submission and details of technical paper publication.

The evaluation of the project stages shall be carried out by the evaluation committee comprising of project guide & other faculty members. The committee will be constituted by the project coordinator in consultation with the Head of the department. ***For Multidisciplinary projects guides will be allotted from each concerned branch***.

Rubrics for Evaluation of project

Stage I (Project Progress):

Evaluation of project phase II is carried out by evaluation committee.

Sl. No.	**Performance Indicators**	**Needs Improvement (0-2 marks)**	**Average (4-6 marks)**	**Good (7-10 marks)**	**Max marks**

1.	System design and development	System specification is not identified.	System specification is identified but not satisfactory.	System specification identified correctly.	10
2.	Identification of appropriate tool for application	Application tools are not identified.	Application tools identified but not used.	Application tools identified and used.	**10**
3.	Oral presentation	Entire contents not delivered.	Contents not delivered clearly.	Contents delivered	**10**
				Total	**30**

Stage II (Mid Phase Project Demonstration with Draft paper):

Evaluation of this phase is done by evaluation committee.

Sl. No.	**Performance Indicator**	**Needs Improvement (0-1 marks)**	**Average (2-3 marks)**	**Good (4-5 marks)**	**Total marks allocated**
1.	Design and Implementation	Design not complete	Design partially completed	Design completed	5
2.	Demonstration	Incomplete.	Complete but not satisfactory.	Complete and satisfactory	5
3.	Technical paper Draft	Organization and technical content not relevant	Organization and technical content of paper complete but needs improvement	Organization and technical content of report are complete and satisfactory	5
4.	Oral presentation	Presentation slides are not clear.	Presentation slides are clear, but not satisfactory.	Presentation slides are clear and satisfactory.	5
				Total	**20**

Stage III (Final Project Demonstration):

Evaluation of this phase is done by evaluation committee.

Sl. No.	**Performance Indicator**	**Needs Improvement**	**Average**	**Good**	**Total marks allocated**

1.	Final project demonstration	Project incomplete (4)	Project complete but needs improvement in interface design/ functionality, etc. (7)	Project completed (10)	10
2.	Oral Presentation	Disorganized and ineffective presentation (4)	Organized, but ineffective presentation (7)	Effective organized presentation (10)	10
3.	Report submission	Disorganized and contents are not sufficient (10)	Organized but not good content wise (16)	Effectively organized and well framed contents (20)	20
4.	Technical paper publication	Paper submitted for National Conference (8)	Paper submitted / published in an International Conference (9)	Paper submitted / published in a Journal (10)	10
				Total	**50**

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	3	-	3	-	-	-	-	-	-	-	2	2
CO2	-	-	-	-	-	-	-	-	3	2	3	-	-	2
CO3	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	-	-	-	-	-
CO5	-	-	3	-	3	-	-	-	-	-	-	-	2	2

MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

Professional Elective Course – III

Course Title	**SOFTWARE TESTING AND QUALITY ASSURANCE**		
Course Code	**22CB771**	**L-T-P-C**	**(3-0-0)3**
Exam Hrs.	**3**	**Hours / Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: To understand software testing fundamentals and apply techniques to ensure quality through effective methodologies.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Evaluate the basic concepts and principles of software testing.	1,2	-
2.	Apply functional and structural testing techniques to software applications.	2,3	-
3.	Analyze and design test cases using various testing methodologies.	3	-
4.	Evaluate and implement testing strategies for software quality assurance.	2,3	-

Course Contents:

Module 1	**10 Hours**

Basics of Software Testing

Definitions of software testing, software quality, requirements, behavior, correctness vs. reliability, testing and debugging, test cases, test-generation strategies, test metrics, error and fault taxonomies, levels of testing, testing and verification, static testing.

Module 2	**10 Hours**

Problem Statements and Functional Testing

Generalized pseudocode, triangle problem, NextDate function, commission problem, SATM problem, currency converter, Saturn windshield wiper. Functional testing techniques: boundary value analysis, robustness testing, worst-case testing, equivalence classes, decision tables.

Module 3	**10 Hours**

Fault-Based and Structural Testing

Fault-based testing: mutation analysis, fault-based adequacy criteria. Structural testing: statement testing, branch testing, condition testing, path testing (DD paths), test coverage metrics, basis path testing, data-flow testing (definition-use testing, slice-based testing).

Module 4	**10 Hours**

Test Execution and Process Framework

Test execution: from test case specification to test cases, scaffolding, test oracles, capture and replay. Process framework: sensitivity, redundancy, restriction, partition, visibility, feedback, quality process, planning and monitoring, quality goals, dependability properties, analysis testing, improving the process, organizational factors.

Text Books:

1. Software Testing: A Craftsman's Approach, Paul C. Jorgensen, 3rd. Auerbach Publications, 2022
2. Foundations of Software Testing, Aditya P. Mathur, 1st Pearson Education, 2023

3. Software Testing and Analysis, Mauro Pezze, Michal Young, 1st Wiley India

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	3	2	-	-	-	-	-	-	-	-	-	-	-

Course Title	**BIG DATA ANALYTICS**		
Course Code	**22CB772**	**L-T-P-C**	**(3-0-0)3**
Exam Hrs.	**3**	**Hours / Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: To design and implement big data systems using modern analytics platforms, stream processing, and scalable frameworks.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Identify various Big Data tools and architectures.	1,2	-
2.	Implement big data operations using Hadoop and MapReduce.	2,3	-
3.	Analyze unstructured data using Map Reducing and MDM.	2,4	-
4.	Extract insights from big datasets using ML techniques.	2,3,4,5	2

Course Contents:

Module 1	**10 Hours**

Introduction: Velocity, Variety, Veracity; Drivers for Big Data, Sophisticated Consumers, Automation, Monetization.

Big Data Analytics Applications: Social Media Command Center, Product Knowledge Hub, Infrastructure and Operations Studies, Product Selection, Design and Engineering, Location-Based Services, Online Advertising, Risk Management.

Module 2	**10 Hours**

Architecture Components: Massively Parallel Processing (MPP) Platforms, Unstructured Data Analytics and Reporting: Search and Count, Context-Sensitive and Domain-Specific Searches, Categories and Ontology, Qualitative Comparisons, Data Privacy Protection, Real-Time Adaptive Analytics and Decision Engines.

Advanced Analytics Platform: Real-Time Architecture for Conversations, Orchestration and Synthesis Using Analytics Engines, Entity Resolution, Model Management, Discovery Using Data at Rest, Integration Strategies.

Module 3	**10 Hours**

Implementation of Big Data Analytics: Revolutionary, Evolutionary, or Hybrid, Big Data

Governance, Integrating Big Data with MDM, Evolving Maturity Levels.
Map-Reduce and the New Software Stack 1: Distributed File Systems. Physical Organization of Compute Nodes, Large-Scale File-System Organization, Map-Reduce features: Map Tasks, Grouping by Key, Reduce Tasks, Combiners, Map-Reduce Execution, Coping With Node Failures.

Module 4	**10 Hours**

Map-Reduce and the New Software Stack 2: Algorithms Using Map-Reduce for Matrix multiplication, Relational Algebra operations, Workflow Systems. Recursive Extensions to Map-Reduce.
Communication Cost Models: Complexity Theory for Map-Reduce, Reducer Size and Replication Rate, Graph Model and Mapping Schemas, Lower Bounds on Replication Rate.
Mining Data Streams: Stream Data Model and Management Stream Source, Stream Queries, and issues, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Ones in a Window, Decaying Windows.

Text Books:

1. Big Data and Analytics, Seema Acharya, Subhashini Chellappan, 2nd, Wiley India, 2019
2. Big Data Analytics: Disruptive Technologies for Changing the Game, Dr. Arvind Sathi, 1st IBM Corporation, 2012
3. Mining of Massive Datasets, Anand Rajaraman, Jure Leskovec, Jeffrey D. Ullman, E-book, 2013

Reference Books:

1. Big Data Imperatives, Soumendra Mohanty, Madhu Jagadeesh, Harsha Srivatsa, A press, 2012
2. Big Data, Big Analytics: Emerging BI and Analytic Trends for Today's Business, Michael Minelli, Michele Chambers, Ambiga Dhiraj1st, Wiley CIO Series, 2013
3. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, 1st Wiley & SAS Business Series, 2012
4. Big Data Imperatives, Soumendra Mohanty, Madhu Jagadeesh, Harsha Srivatsa, Apress, 2012

E Books and online course materials:

1. https://www.kaggle.com/datasets/grouplens/movielens-20m-dataset
2. https://nptel.ac.in/courses/106104189

Online Courses and Video Lectures:

1. https://www.youtube.com/watch?v=bAyrObl7TYE&list=PLEiEAq2VkUUJqp1k-g5W1mo37urJQOdCZ
2. https://www.youtube.com/watch?v=GG-VRm6XnNk

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	-	3	-	-	-	-	-	-	-	-	-	-
CO4	-	2	3	2	2	-	-	-	-	-	-	-	-	2

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Course Title	**ADVANCED JAVA**		
Course Code	**22CB773**	**L-T-P-C**	**(3-0-0)3**
Exam Hrs.	**3**	**Hours / Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: Students should be able to use J2EE concepts to create an application.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	**Course Outcomes**	**Mapping to POs**	**Mapping to PSOs**
1.	Explain and use java enumerations, collections, type wrapper and auto boxing in developing modular programs	1	-
2.	Design GUI using swings and applets	3	-
3.	Build database applications using JDBC.	2,3	-
4.	Develop distributed web application using Servlets and JSP.	2,3	-

Course Contents:

Module 1	**10 Hours**

Enumeration and Autoboxing: Enumeration fundamentals, values() and valuesOf() Methods, Java Enumerations are class types, example, Type Wrappers, Autoboxing and Autounboxing. **Event Handling** The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes

Module 2	**10 Hours**

User Interface components with Swing Components and containers, Layout managers, A first simple swing example, Event Handling, Creating a swing applet, Exploring Swing Controls-JLabel and ImageIcon, Jtextfield The Swing buttons, JTabbedPane, JScrollPane, JList, JCombobox.

Module 3	**10 Hours**

The Collections Framework – Collections overview, The collection Interfaces, The collection classes, Accessing collection via an iterator. **Database Access**- The Concept of JDBC, JDBC Driver Types, JDBC Packages, A Brief Overview of the JDBC process, Database Connection, Statement Objects, Result Set

Module 4	**10 Hours**

Servlets and JSP - Lifecycle of a sevelet, A simple servlet, The Servlet API, javax.servlet Package, Reading Servlet parameters, The javax.servlet.http Package, Handling HTTP Request and Responses, Using Cookies, Session tracking. **Java Server Pages (JSP):** JSP, JSP Tags, User Sessions, Cookies, Session Objects. **RMI** -. Java Remote Method Invocation: Remote Method Invocation concept; Server side, Client side.

Text Books:

1. Java The Complete Reference, Herbert Schildt, 8th Edition, McGraw Hill, 2013
2. J2EE The Complete Reference, Jim Keogh, Tata McGraw Hill, 2007

Reference Books:

1. Advanced Java Programming, Uttam.K.Roy, Oxford Press, 2015
2. Java Fundamentals, Herbert Schildt Dale Skrien, McGrawHill, 2013
3. Head First Servlets and JSP, Shroff, 2nd Edition, O,Reilly Publications, 2008

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Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	3	2	-	-	-	-	-	-	-	-	-	-
CO4	-	3	2	-	-	-	-	-	-	-	-	-	-

Course Title	**DEEP LEARNING**		
Course Code	**22CB774**	**L-T-P-C**	**(3-0-0)3**
Exam Hrs.	**3**	**Hours / Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: To understand deep learning fundamentals and apply CNNs, RNNs, and algorithms to real-world problems.
Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	**Course Outcomes**	**Mapping to POs**	**Mapping to PSOs**
1.	Analyze and interpret the concepts of neural networks relating to artificial intelligence.	2,3	-
2.	Illustrate the learning processes and their statistical properties.	3,4	1
3.	Design deep learning models using regularization and convolutional operations.	3,4	1
4.	Analyze sequential data to build recurrent and recursive models.	3,4	-

Course Contents:

Module 1	**10 Hours**

Neural Networks and Learning Fundamentals
Neural networks overview, Biological neuron vs artificial neuron, Models of a neuron, Neural Networks as Directed Graphs, Feedback, Network Architectures, Perceptron and its convergence theorem, Perceptron vs Bayes Classifier. Introduction to Multilayer Perceptrons, Batch and Online Learning, Backpropagation Algorithm, XOR Problem, Heuristics for Improving Backpropagation, Differentiation in Backpropagation.

Module 2	**10 Hours**

Regularization and Optimization in Deep Learning L2 Parameter Regularization, Dataset Augmentation, Semi-supervised Learning. Optimization Challenges – Ill-conditioning, Local Minima, Plateaus, Saddle Points, Flat Regions. Training difficulties and solutions.	
Module 3	**10 Hours**
Convolutional and Recurrent Neural Networks Convolution Operation, Pooling, Efficient Convolution Algorithms, CNN Variants, History of Deep Learning. Recurrent and Recursive Nets, Unfolding Computational Graphs, Bidirectional RNNs, Encoder-Decoder Models, Deep RNNs, LSTM and Gated RNNs.	
Module 4	**10 Hours**
Autoencoders and Deep Learning Applications Concept of Autoencoders, Training Autoencoders, Applications in Dimensionality Reduction and Data Compression, Real-world Use Cases in Vision, NLP, and Forecasting.	
Text Books: 1. Neural Networks and Learning Machines, Simon Haykin, 3rd, Pearson, Pearson, 2016 2. Deep Learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville, 1st MIT Press, 2016	
Online Courses and Video Lectures: 1. https://www.deeplearningbook.org/lecture_slides.html 2. https://www.coursera.org/learn/neural-networks-deep-learning 3. https://onlinecourses.nptel.ac.in/noc20_cs62/preview	

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	2	-	-	-	-	-	-	-	-	2	-
CO3	-	-	3	2	-	-	-	-	-	-	-	-	2	-
CO4	-	-	3	2	-	-	-	-	-	-	-	-	-	-

OPEN ELECTIVES - II

Course Title	**BUSINESS MANAGEMENT**		
Course Code	**22OECB71**	**L-T-P-C**	**(3-0-0) 3**
Exam Hrs.	**3**	**Hours / Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: To equip students with foundational knowledge and practical insights into key principles, functions, and strategies of management in modern organizations.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	**Course Outcomes**	**Mapping to POs**	**Mapping to PSOs**

1.	**Analyze** key management concepts, including managerial roles, social responsibility, and ethics, as well as different types of business ownership.	6,7	-
2.	Illustrate knowledge of planning, strategy formulation (e.g., TOWS matrix), and decision-making techniques for managerial effectiveness.	2,10	-
3.	Identify and apply principles of organizational design and staffing, including types of structures and performance appraisal techniques.	1,6	-
4.	Distinguish between various leadership theories, motivation models, and communication processes, with insights into international management approaches like Japanese Theory Z.	1,10	-

Course Contents:

Module 1	**10 Hours**

Management, Science, Theory and Practice: Definition of Management, Its nature and purpose, managerial skills and organizational hierarchy, Managing- Science or Art? Contributions of F.W. Taylor and Henry Fayol, Functions of managers, levels of management, Management and Society: Social responsibility of managers, Ethics of managing.

Ownership of Enterprises: Proprietorship, Partnership, types, Joint stock Companies - Private and Public limited companies Public sector companies, Co-operative organizations, types, methods of raising capital.

Module 2	**10 Hours**

Planning: Definition of planning, Types of plans, steps in planning, MBO, how to Set Objectives, Benefits and weakness of MBO Some Recommendations.

Strategies, Policies and Planning Premises: Nature and Purpose of Strategies and Policies, TOWS matrix: A modern tool for analysis of the situation, Major kinds of strategies and policies.

Decision Making: Importance and limitations of rational decision making, Rationality in decision making, Evaluation of alternatives, Selecting an alternative- three approaches, Programmed and Non-programmed decisions.

Module 3	**10 Hours**

Organizing: The nature and purpose of organizing, Formal and informal organization. Organization levels and Span of management, a system approach to organization, principles of organization, principles of organization, Types of organization: line, military or scalar, functional, project/product/departmentation, matrix/grid.

Staffing: Definition of Staffing, Systems approach to human resources, Situational factors affecting staffing. Selection- matching the person with the job, Skills and personal characteristics needed by managers, Selection process, Techniques and instruments, purpose of Performance appraisal.

Module 4	**10 Hours**

Leading: Human factors in managing, Motivations and motivators. Maslows Hierarchy of needs Theory, Herzberz motivation- Hygine theory, mcgregors theory X and theory Y, Leadership: Leadership behavior and Leadership styles.

Communication: Importance of Communication, Purpose of Communication, Communication process, Types of communication, Effective communication.

International Management: Managerial functions in international business, Japanese management and Theory Z.

Text Books:

1. Principles of Management, Harold Koontz, H. Weihrich, A.R. Aryasri, 4th Tata McGraw-

Hill, New Delhi. 2015
2. Industrial Engineering and Management ,OP Khanna, 3rd Dhanpat Rai and Sons
3. Management of Organizational Behaviour, Hershey Paul and Kenneth Blanchard 2012

Reference Books:

1. Essentials of Management, Harold Koontz, H. Weihrich, 5th Tata McGraw-Hill, 2015
2. Management of Organizational Behaviour, 2nd PHI, 2013

Online Courses and Video Lectures:

1. **https://onlinecourses.nptel.ac.in/noc23_mg33/preview**

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	3	3	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	2	-	-	-
CO3	3	-	-	-	-	2	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	2	-	-	-

Course Title	**AI FOR BUSINESS AND FINANCE**		
Course Code	**22OECB72**	**L-T-P-C**	**(3-0-0)3**
Exam Hrs.	**3**	**Hours / Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: To integrate fundamental finance concepts with artificial intelligence and data analytics, enabling students to apply machine learning, and AI models in investment analysis, portfolio construction, optimization, and performance evaluation.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	**Course Outcomes**	**Mapping to POs**	**Mapping to PSOs**
1.	Evaluate risk-return characteristics of financial instruments and markets.	2,3	-
2.	Apply AI and machine learning algorithms to financial data.	3,4	-
3.	Develop and optimize portfolios using R-based statistical analysis.	3	-
4.	Analyze and interpret performance using asset pricing models.	3,4	-

Course Contents:

Module 1	**10 Hours**

Introduction to Financial Markets and Investment Decisions

Risk-Return Analysis, Measures of Risk and Return, Value and Goals of a Firm, Cash Flow Discounting, Investment Decisions, Valuation of Fixed Income Securities and Common Stocks, Portfolio Theory, Asset Pricing Models, Cost of Capital.

Module 2	**10 Hours**

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AI Models and R Programming in Finance Overview of AI & Machine Learning, Supervised and Unsupervised Learning, Probability Modelling, Inferential Statistics, Hypothesis Testing. R Programming Basics, Exploratory Data Analysis (EDA), Data Visualization, Statistical Analysis with R.	
Module 3	**10 Hours**
Market Microstructure and Portfolio Construction Market Types: Order-driven and Quote-driven, Market Efficiency, Risk Preferences, Limit Order Books, Economic Theory of Choice, Interest Rate Compounding. Portfolio Risk and Return (Two & Multi-Asset), Risk Diversification, Correlation Structure, Mean-Variance Framework, Portfolio Construction using R.	
Module 4	**10 Hours**
Portfolio Optimization, Asset Pricing and Performance Evaluation Efficient Frontier, Minimum Variance Portfolios, Risk-Free Lending & Borrowing, Market Risk and Beta, CAPM, Security Market Line, Single & Multi-Index Models, Fama-French 3-Factor Model, Active vs Passive Management, Performance Measures, Application of Asset Pricing Models.	
Text Books: 1. Machine Learning in Finance, M. Dixon, I. Halperin, P. Bilokon, 1st Springer 2. Advances in Financial Machine Learning, Marcos Lopez, 1st Wiley	
Reference Books: 1. Machine Learning for Asset Managers Marcos Lopez 1st Cambridge Univ. Press 2. Machine Learning for Algorithmic Trading, Stefan Jansen, 2nd Packt 3. Modern Portfolio Theory, Elton & Gruber, 9th Wiley	
Online Courses and Video Lectures: 1. https://www.investopedia.com/ 2. https://www.r-bloggers.com/ 3. https://www.coursera.org/specializations/ai-for-finance	

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	2	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	2	-	-	-	-	-	-	-	-	-	-

Course Title	**ENTREPRENEURSHIPANDBUSINESS DEVELOPMENT**		
Course Code	**22OECB73**	**L-T-P-C**	**(3-0-0) 3**
Exam Hrs.	**3**	**Hours/Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**
Course Objective: Explore the role of entrepreneurship and business in driving economic growth, employment, and social change, with a focus on transition economies. **Course Outcomes(COs):**Upon completion of the course, students shall be able to:			

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No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe the structure of modern business enterprise, role of industries and government policies in developing business	6	-
2.	Classify the different types of entrepreneurs and identify the characteristics of a successful entrepreneur	6,8	-
3.	Motivate to take-up entrepreneurship	6	2
4.	Apply the stages involved in starting an enterprise, develop and implement a business plan	6	-

Course Contents:

Module1	10 Hours

Modern Business Enterprises: Role of small scale industries, Concept and definitions of SSI, Government policy and Development of the small scale sector in India, Growth & Performance of small scale industries in India. Problems for small-scale industries, Prospects for small scale industries in a free economy.
Entrepreneurship: Importance of Entrepreneurship, concepts of Entrepreneurship, characteristics of a successful Entrepreneur, classification of Entrepreneurs, Myths of entrepreneurship, Entrepreneurial development models, Profiles of successful entrepreneurs.

Module2	10 Hours

Women Entrepreneurs: Women Entrepreneurship defined, Women entrepreneurship environment, challenges in the path of women entrepreneurship, Strategies for the development of women entrepreneurs, Institutions supporting women entrepreneurs in India, women entrepreneurs in India, Any two case studies Institutions
Supporting Small Business Enterprises: Introduction, central level institutions, State level institutions. Other agencies, Industry associations

Module3	10 Hours

Setting up a Small Business Enterprise: Identifying the business opportunity, Business opportunities in various sectors. Formalities for setting up a small business enterprise
Sickness in Small Business Enterprises: Definition of sickness and Present status of sickness of SSIs in India, Criteria for identifying sickness/incipient sickness, causes for sickness/incipient sickness in SSI, Symptoms of sickness, Cures for SSI ssickness, Any two case studies

Module4	10 Hours

Strategic Management in Small Business: Organization life cycle, strategic management, the essence of business ethics, Financial management in small business: Importance of financial management, working capital management.
Family Business: Importance of family business, Various types of family business, History of the family business, Responsibility and rights of family shareholders of a family business, strategies for improvingthecapabilityofafamilybusiness,managementdevelopmentplaninfamilybusiness,
Family reunion games promote family value, how to save the family business.

Text Books:
Entrepreneurship Development-Small Business Enterprises, Poornima. M, Charatimat, Pearson Education in South Asia

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Reference Books:
1.Dynamics of entrepreneurial development and Management, Vasant Desai, Himalayan Publishing House Entrepreneurship development, S.S. Khanka, S. Chand & Co, New Delhi.
MOOC's:
1. https://onlinecourses.nptel.ac.in/noc21_mg70/preview

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	3	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	3	-	2	-	-	-	-	-	-
CO3	-	-	-	-	-	3	-	-	-	-	-	-	-	2
CO4	-	-	-	-	-	3	-	-	-	-	-	-	-	-

Course Title	**HUMAN-COMPUTER INTERACTION(HCI)**		
Course Code	**22OECB74**	**L-T-P-C**	**(3-0-0)3**
Exam Hrs.	**3**	**Hours / Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: To understand the fundamentals of human-computer interaction (HCI), apply user-centered design principles, evaluate user interfaces, and explore emerging trends and technologies in the field.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	**Course Outcomes**	**Mapping to POs**	**Mapping to PSOs**
1.	Evaluate the principles and importance of user interface design.	1,2	-
2.	Apply HCI design processes to develop user-centered interfaces.	2,3	-
3.	Illustrate user interfaces using standard HCI evaluation techniques.	3,4	-
4.	Analyze emerging trends and technologies in human-computer interaction.	3,4	-

Course Contents:

Module 1	**10 Hours**

Introduction to HCI

Definition and importance of Human-Computer Interaction (HCI), benefits of good design, history of screen design, graphical user interfaces: popularity and characteristics, principles of user interface design.

Module 2	**10 Hours**

HCI Design Process

Human interaction with computers, importance of human characteristics and considerations, human interaction speeds, understanding business functions, screen design goals and planning, organizing

screen elements and navigation.	
Module 3	**10 Hours**
Interface Components and Windows Windows: characteristics, components, and presentation styles, types of windows and their management, device-based and screen-based controls, text, messages, icons, multimedia, and color usage in interfaces.	
Module 4	**10 Hours**
HCI in the software process, usability engineering, iterative design and prototyping, design rules, standards, and heuristics, evaluation techniques: expert analysis and user participation, universal design principles, multi-modal interaction.	

Text Books:

1. Human-Computer Interaction, Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale 3rd Pearson Education 2004
2. Designing the User Interface, Ben Shneiderman, Catherine Plaisant, 5th Pearson Education 2009
3. The Essential Guide to User Interface Design, Wilbert O. Galitz, 3rd Wiley DreamTech 2007

Reference Books:

1. User Interface Design and Evaluation, Debbie Stone et al. 1st Morgan Kaufmann 2005
2. About Face: The Essentials of Interaction Design, Alan Cooper et al. 4th Wiley 2014

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	2	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	2	-	-	-	-	-	-	-	-	-	-

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EIGHTH SEMESTER : SYLLABUS

Course Title	**RESEARCH / INDUSTRY INTERNSHIP**		
Course Code	**22INT**	**L-T-P-C**	**(0-0-20)10**
Exam Hrs.	**3**	**Hours / Week**	**-**
CIE	**100 Marks**	**Total Hours**	**-**

Course Objective: To gain the perspective of work environment in Research organization/Industry.
Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	**Course Outcomes**	**Mapping to POs**	**Mapping to PSOs**
1.	Apply the domain knowledge in solving the real world problems.	1,2	1,2
2.	Work as a team member towards the chosen problem	9	1,2
3.	Work with industry professionals and practice ethics in work environment.	8, 10,12	1,2
4.	Document, publish and present the work carried out.	9,10,11,12	1,2

Guideline: Students shall undergo In-house/ Research organization/Industry internship for a duration of ***one*** semester. At the end of the semester internal evaluation will be conducted for 100 marks according to the following rubrics.

Rubrics:

Criteria	**Excellent**	**Good**	**Average**	**Poor**
Ability to apply domain knowledge (20M)	Apply domain knowledge for design and development of all issues (20M)	Apply domain knowledge for design and Development of most issues (15M)	Apply domain knowledge for Design and development of specific issues (10M)	Unable to apply complete domain knowledge for Design and development issues (5M)
Ability to develop/ implement the solutions with appropriate techniques, resources and contemporary tools (20M)	Able to develop/ implement all the solutions with appropriate techniques, resources and contemporary tools (20M)	Able to develop/ implement most of the solutions with appropriate techniques, resources and contemporary tools (15M)	Able to develop /implement specific solutions with appropriate techniques, resources and contemporary tools (10M)	Not confident to develop/implement solutions with appropriate techniques, resources and contemporary tools (5M)

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Ability to work independently and in collaboration /multidisciplinary environment. (20M)	Able to work independently and in collaboration/ multidisciplinary environment. (20M)	Able to work independently with minimal guidance and in collaboration/ multidisciplinary environment.(15 M)	Able to work independently with more guidance and in collaboration/ multidisciplinary environment. (10M)	Unable to work independently without guide support and in collaboration/ multidisciplinary environment. (5M)

Ability to allocate time effectively and manage to complete the work allotted within appropriate time. (15M)	Able to allocate time effectively and complete all the work allotted within appropriate time. (15M)	Able to allocate time effectively and complete most of the work allotted within appropriate time. (10M)	Able to allocate time effectively and manage to complete the work allotted (5M)	Unable to use time effectively and complete the work allotted.(3M)
Ability to exhibit integrity and ethical behaviour while carrying Out the internship and For the preparation of internship report. (15M)	Able to effectively exhibit integrity and ethical behaviour while carrying out the internship and for the preparation of internship report.(15M)	Able to moderately exhibit integrity and ethical behaviour while carrying out the internship and for the preparation of internship report. (10M)	Able to partially exhibit integrity and ethical behaviour while carrying out the internship and for the preparation of internship report. (6M)	Unable to exhibit integrity and ethical behaviour while carrying out the internship and for the preparation of internship report. (3M)
Ability to demonstrate effective oral and written communicatio n skills (10M)	Able to demonstrate effective oral and written communication skills (10M)	Able to demonstrate oral and written communication skills moderately. (7M)	Able to demonstrate oral and written communication skills minimally. (5M)	Unable to demonstrate effective verbal and written communication skills (2M)

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Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	2
CO2	-	-	-	-	-	-	-	-	3	-	-	-	3	2
CO3	-	-	-	-	-	-	-	3	-	3	-	3	3	2
CO4	-	-	-	-	-	-	-	-	3	3	3	3	3	2