

BE SCHEME & SYLLABUS

Fourth Year (VII and VIII Semester)

With effect from 2022-23



Computer Science & Business Systems



ST JOSEPH ENGINEERING COLLEGE

AN AUTONOMOUS INSTITUTION

Vamanjoor, Mangaluru - 575028

MOTTO

Service & Excellence

VISION

To be a global premier Institution of professional education and research.

MISSION

- Provide opportunities to deserving students of all communities, the Christian students in particular for quality professional education.
- Design and deliver curricula to meet the national and global changing needs through student-centric learning methodologies.
- Attract, nurture and retain the best faculty and technical manpower.
- Consolidate the state-of-art infrastructure and equipment for teaching and research activities.
- Promote all round personality development of the students through interaction with alumni, academia and industry.
- Strengthen the Educational Social Responsibilities (ESR) of the institution.



ST JOSEPH ENGINEERING COLLEGE

An Autonomous Institution
Vamanjoor, Mangaluru - 575028

Affiliated to VTU – Belagavi & Recognized by AICTE New Delhi
NBA – Accredited: B.E. (ECE, EEE, ME and CIV) & PG (MBA and MCA)
NAAC – Accredited with A+

B.E. SCHEME & SYLLABUS (With effect from 2022-23)

Computer Science and Business Systems

FOURTH YEAR (VII and VIII Semester)

AUTONOMY AND ACCREDITATION

St Joseph Engineering College (SJEC) is an Autonomous Institute under Visvesvaraya Technological University (VTU), Belagavi, Karnataka State, and is recognized by the All-India Council for Technical Education (AICTE), New Delhi. SJEC is registered under the trust “Diocese of Mangalore, Social Action Department”.

The SJEC has been conferred Fresh Autonomous Status from the Academic Year 2021-22. The college was granted autonomy by the University Grants Commission (UGC) under the UGC Scheme for Autonomous Colleges 2018 and conferred by VTU. The UGC Expert Team had visited the college on 28-29 November 2021 and rigorously assessed the college on multiple parameters. The fact that only a handful of engineering colleges in the state have attained Autonomous Status adds to the college’s credibility that has been on a constant upswing. Autonomy will make it convenient for the college to design curricula by recognizing the needs of the industry, offering elective courses of choice and conducting the continuous assessment of its students.

At SJEC, the Outcome-Based Education (OBE) system has been implemented since 2011. Owing to OBE practised at the college, SJEC has already been accredited by the National Board of Accreditation (NBA). Four of the UG programs, namely Mechanical Engineering, Electronics and Communication Engineering, Electrical & Electronics Engineering and Civil Engineering and two of the PG programs, namely, MBA and MCA programs, have accreditation from the NBA.

Also, SJEC has been awarded the prestigious A+ grade by the National Assessment and Accreditation Council (NAAC) for five years. With a Cumulative Grade Point Average (CGPA) of 3.39 on a 4-point scale, SJEC has joined the elite list of colleges accredited with an A+ grade by NAAC in its first cycle. The fact that only a small percentage of the Higher Education Institutions in India have bagged A+ or higher grades by NAAC adds to the college’s credibility that has been on a constant upswing.

The college is committed to offering quality education to all its students, and the accreditation by NAAC and NBA reassures this fact. True to its motto of “Service and Excellence”, the college’s hard work has resulted in getting this recognition, which has endorsed the academic framework and policies that the college has been practicing since its inception. The college has been leveraging a flexible choice-based academic model that gives students the freedom to undergo learning in respective disciplines and a transparent and continuous evaluation process that helps in their holistic development.

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ABOUT THE DEPARTMENT

SJEC takes pride to launch in partnership with India's leading IT Service and Consulting Company – TCS, an industry ready BE Programme titled Computer Science and Business Systems (CSBS) to cater to the rising need of engineering talent with skills in Business Systems. This Four-Year undergraduate degree programme is offered with an intake of 60, Autonomous under VTU -Belagavi. This state-of-the-art programme aims to impart knowledge of cutting-edge technologies and business skills with hands-on exposure to help the students be industry-ready.

The Computer Science and Business Systems programme in collaboration with TCS aims to expose students not only to the core topics of Computer Science but also develop an equal understanding of humanities, human values and management sciences. This programme is an apt choice for students aspiring to be business leads in the IT industry. Students will also gain excellent industrial exposure on emerging topics such as Business Analytics, Machine Learning, Cloud Computing, Internet of Things etc.

DEPARTMENT VISION

To impart value-based quality education with the motive of transforming mankind with excellence and competing areas of engineering, technology and management.

DEPARTMENT MISSION

1. Focus on the practical aspects of the curriculum to make learning a meaningful and interesting experience.
2. Encourage active collaboration with industries, communities, and fellow institutions within the country and abroad.
3. Infuse strong moral and ethical principles in students in order to make them conscientious citizens and excellent human beings.
4. Cultivate the competitive spirit required for success.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. To provide students with a solid foundation and the ability to use engineering concepts, mathematics, physics, and humanities required to develop, analyse, design, and implement solutions to the problems in intelligent computing and business systems.
2. To develop in students, the knowledge of computer science and engineering to work in domains such as artificial intelligence, machine learning and data science.
3. To foster in students, the capacity of teamwork through efficient communication in multidisciplinary projects.
4. To prepare students for building successful careers in artificial intelligence, data science and business systems to meet the needs of society while incorporating professional ethics.
5. To inspire learners to pursue higher education in their desired fields and engage in research.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using principles of mathematics, natural sciences and engineering sciences with consideration for sustainable development.

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. **Entrepreneurship and Freelancing:** Recognize the tenets of entrepreneurship, freelancing and the prerequisites for starting a business in the IT or related fields.
2. **Competitive Exams:** Participate skillfully in competitive examinations for certification, professional advancement, and admission to higher studies.

VII Semester (B.E. – Computer Science and Business Systems)

Sl. No.	Course and Course Code		Course Title	Teaching Department	Paper Setting Board	Teaching Hours/Week			Examination				Credits
						Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total	
1	IPCC	22CBS71	Business Intelligence and Data Analytics	CBS	CBS	3	-	2	03	50	50	100	4
2	IPCC	22CBS72	Usability Design of Software Applications	CBS	CBS	3	-	2	03	50	50	100	4
3	PCC	22CBS73	Cloud Computing	CBS	CBS	3	-	-	03	50	50	100	3
4	PEC	22CBS74X	Professional Elective -III	CBS	CBS	3	-	-	03	50	50	100	3
5	PRJ	22CBS75	Major Project Phase - II	CBS	CBS	-	-	6	03	50	50	100	6
Total						12	-	10	15	250	250	500	20

22CBS74X : Professional Elective III

22CBS741	Total Quality Management	22CBS743	Supply Chain Management
22CBS742	Social Network Analysis	22CBS744	Augmented and Virtual Reality

VIII Semester (B.E. – Computer Science and Business Systems)													
Sl. No.	Course and Course Code		Course Title	Teaching Department	Paper Setting Board	Teaching Hours/Week			Examination				Credits
						Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total	
						L	T	P					
1	PEC	22CBS81	Professional Elective IV (Online Course)	Any MOOC topic (Choices are given by respective Department) with minimum 12 weeks to be completed before the end of 8th semester.							100	3	
2	OEC	22CBS82	Open Elective -II (Online Course)	Any MOOC topic (Choices are given by respective Department) with minimum 12 weeks to be completed before the end of 8th semester.							100	3	
3	INT	22CBS83	Research / Industry Internship			-	-	-	03	50	50	100	10
Total						-	-	-	03	50	50	300	16

Note: a. Professional Elective IV: These are ONLINE courses suggested by the respective Board of Studies (Department).

b. Open Elective -II: These are ONLINE courses suggested by the respective Board of Studies (Department).

c. During 4th year of the program i.e., after VII semester, students shall take up the **Research Internship /Industrial Internship for 14-16 weeks.** Research/Industrial Internship shall be carried out at an Industry, NGO, MSME, Innovation centre, Incubation centre, Start-up, Centre of Excellence (CoE), Study Centre established in the parent institute and /or at reputed research organizations/institutes.

VII Semester

Business Intelligence and Data Analytics			
Course Code	22CBS71	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:2	SEE	3 Hours
Total Hours	40 hours Theory + 10 Lab slots	Credits	04
Course Learning Objectives: The objective of the course is to • Explain the Fundamentals of Business Intelligence and Analytics. • Develop Skills in Data Processing and Descriptive Analytics. • Apply Predictive Analytics and Data Mining Techniques. • Explore Text, Web, and Social Media Analytics. • Enable Decision-Making with Prescriptive Analytics and Optimization.			
Module-1: Introduction to BI			8 hours
An Overview of Business Intelligence, Analytics, Data Science: Changing Business Environments and Evolving Needs for Decision Support and Analytics, Evolution of Computerized Decision Support to Analytics/Data Science, A Framework for Business Intelligence, Analytics Overview. Ch. 1			
Module-2: Descriptive Analytics I			8 hours
Descriptive Analytics I -Nature of Data, Big Data, and Statistical Modeling: The Nature of Data in Analytics, A Simple Taxonomy of Data, The Art and Science of Data Preprocessing, Definition of Big Data, Fundamentals of Big Data Analytics, Big Data Technologies, Big Data and Stream Analytics, Statistical Modeling for Business Analytics, Regression Modeling for Inferential Statistics. Statistical Modeling for Business Analytics, Regression Modeling for Inferential Statistics. Ch. 2,7			
Module-3: Descriptive Analytics II			8 hours
Descriptive Analytics II: Business Intelligence Data Warehousing, and Visualization: Business Intelligence and Data Warehousing, Data Warehousing Process, Data Warehousing Architectures, Data Management and Warehouse Development, Data Warehousing Implementation Issues, Data Warehouse Administration, Security Issues, and Future Trends, Business Reporting, Data Visualization, Different Types of Charts and Graphs, The Emergence of Visual Analytics, Information Dashboards. Ch. 2,3			
Module-4: Advanced Analytics & Prescriptive Analytics			8 hours
Predictive Analytics I - Data mining process, methods, and Algorithms: Data Mining Concepts and Applications, Data Mining Applications, Data Mining Process, Data Mining Methods. Prescriptive Analytics - Optimization and Simulation: Model-Based Decision-Making, Structure of Mathematical Models for Decision Support, Certainty, Uncertainty, and Risk, Decision Modeling with Spreadsheets. Ch. 4,6			
Module-5: Predictive Analytics-II and Future Trends			8 hours
Predictive Analytics II - Text, Web, and Social Media Analytics: Text Analytics and Text Mining Overview, Natural Language Processing (NLP), Text Mining Applications, Text Mining Process, Sentiment Analysis and Topic Modeling, Web Mining Overview, Search Engines, Web Usage Mining (Web Analytics), Social Analytics. Future Trends, Privacy and Managerial Considerations in Analytics: Internet of Things, IoT Technology Infrastructure, Cloud Computing and Business Analytics, Location-Based Analytics for Organizations, Issues of Legality, Privacy, and Ethics. Ch. 5, 8			

PRACTICAL MODULE

PART A

1. Utilize Tableau Public to generate visual analytics for a given business scenario, transforming raw data into insightful visual representations for better decision-making.
2. Implement predictive analytics and data mining techniques to enhance customer experience using an appropriate business case. Utilize tools such as Weka, RapidMiner, Spark, R, or Microsoft Power BI.
3. Perform cluster analysis on a given customer dataset using the K-Means algorithm to identify distinct customer segments. Implement the solution using Python, R, or any other suitable tool.
4. Apply the Apriori algorithm to analyze a transaction dataset and identify frequent item sets, helping to uncover purchasing patterns and associations. (use Python/R/any other tool)
5. Analyze a dataset of customer product reviews (e.g., Amazon reviews) to classify sentiments as positive, negative, or neutral using a pre-trained machine learning model like Naïve Bayes. Evaluate the model's accuracy using Python, R, or any other tool.
6. Extract textual content from multiple web pages (e.g., news sites, blogs) using web scraping techniques. Analyze the extracted data to detect emerging trends and topics. Implement this using Python, R, or any other relevant tool.
7. Scrape user comments from a web forum or blog post and analyze their sentiment using a suitable sentiment analysis technique. Determine the overall tone of the discussion and visualize the sentiment distribution using a pie chart or bar graph (use Python/R/any other tool).
8. Extract insights from a collection of news articles using text mining techniques. Identify common terms and apply Latent Dirichlet Allocation (LDA) to uncover hidden topics within the dataset. Implement this using Python, R, or any suitable tool.

PART B [Open Ended Experiments]

9. Given a dataset representing a social network (e.g., Twitter follower data), construct a graph and analyze the network using Social Network Analysis (SNA). Identify influential users using centrality measures such as degree, closeness, and centrality.
10. Develop a web crawler to extract and analyze the hyperlink structure of a website. Construct a visual representation of the internal and external links, and apply algorithms such as PageRank or HITS to identify the most influential pages within the network. Utilize Python, R, or any suitable tool for implementation.

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

22CBS71.1	Explain the evolution of decision support systems and their impact on modern business intelligence and analytics frameworks.
22CBS71.2	Apply data preprocessing techniques to clean, transform, and analyze large datasets using statistical and machine learning approaches.
22CBS71.3	Apply visualization tools to analyze business data and generate insights for decision-making.
22CBS71.4	Analyze the effectiveness of data mining algorithms for predictive modeling and decision-making.
22CBS71.5	Analyze text, web, and social media data to identify patterns, trends, and user sentiments for business insights.
22CBS71.6	Analyze diverse data sources, apply analytical techniques, and develop business intelligence solutions to support data-driven decision-making in organizations.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Business Intelligence, Analytics, And Data Science:A Managerial Perspective	Ramesh Sharda, Dursun Delen and Efraim Turban	Pearson	4 th Edition, Global Edition, 2018
Reference Books				
1	Business Intelligence Strategy and Big Data Analytics - A General Management Perspective	Steve Williams	Morgan Kaufmann (Elsevier)	2016
2	Data Analytics and Business Intelligence - Computational Frameworks, Practices, and Applications	Vincent Charles, Pratibha Garg, Neha Gupta and Mohini Agarwal	CRC Press	2023

Web links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc25_cs17/preview
- <https://www.geeksforgeeks.org/data-analysis-with-python/>
- <https://www.geeksforgeeks.org/data-analysis-with-python/>

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
22CBS71.1	3	-	-	-	-	1	-	-	-	-	-	-	-
22CBS71.2	-	2	-	2	1	-	-	-	-	-	-	-	-
22CBS71.3	-	1	-	-	2	-	-	-	2	-	-	-	-
22CBS71.4	-	2	-	1	1	-	-	-	-	-	-	-	-
22CBS71.5	-	-	-	2	-	1	-	1	-	-	-	-	-
22CBS71.6	-	-	2	-	-	-	-	-	-	1	-	-	-

1: Low 2: Medium 3: High

Usability Design of Software Applications			
Course Code	22CBS72	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:2	SEE	3 Hours
Total Hours	40 hours Theory + 10 Lab slots	Credits	04
Course Learning Objectives: The objective of the course is to • Explain the fundamental principles of usability, design, and human-computer interaction. • Apply data gathering and analysis techniques to support UX research. • Explore the key components, processes, and techniques involved in UX design. • Apply agile UX methodologies and design models for effective user interaction.			
Module-1: Introduction			8 hours
Usability of Interactive Systems: Introduction, Usability Goals and Measures, Usability Motivations, Goals for Our Profession Guidelines, Principles, and Theories: Introduction, Guidelines, Principles, and Theories. Design: Introduction, Organizational Support for Design, The Design Process, Design Frameworks, Design Methods, Design Tools, Practices, and Patterns, Social Impact Analysis, Legal Issues TB1: Ch. 1, 3, 4			
Module-2: Data Manipulation			8 hours
Data Gathering: Introduction, Six Key Issues, Capturing Data, Interviews, Questionnaires, Observation, Putting the Techniques to work. Data Analysis, Interpretation and Presentation: Introduction, Quantitative and Qualitative, Basic Quantitative Analysis, Basic Qualitative Analysis, Analytical Frameworks, Tools to Support Data Analysis, Interpreting and Presenting the Findings TB2: Ch. 8, 9			
Module-3: Introduction to UX			8 hours
What Are UX and UX Design? The Expanding Concept Of Interaction, Definition Of UX, UX Design, The Components Of UX, What UX Is Not, Kinds Of Interaction And UX. The Wheel: UX Processes, Lifecycles, Methods, and Techniques: Introduction, The Basic Process Components for UX, The Fundamental UX Lifecycle Activities, UX Design Techniques as Life Skills, Choosing UX Processes, Methods, And Techniques, TB3: Ch. 1, 2			
Module-4: Agile UX			8 hours
Agile Lifecycle Processes and the Funnel Model of Agile UX: Challenges in Building Systems, The Old Waterfall SE Lifecycle Process, Embracing an Agile Lifecycle Process, The Funnel Model of Agile UX Generative Design: Ideation, Sketching, and Critiquing: Introduction, Ideation, Sketching, Critiquing, Rules of Engagement for Ideation, Sketching, And Critiquing TB3: Ch. 4, 14			
Module-5: Design Models and Interaction			8 hours
Mental Models and Conceptual Design: Introduction, How A Conceptual Design Works as A Connection of Mental Models, Design Starts with Conceptual Design Designing the Interaction: Introduction, designing for Interaction Needs, creating an Interaction Design, Storyboards, Wireframes, Intermediate Interaction Design, Interaction Design Production, Maintain A Custom Style Guide TB3: Ch. 15, 17			

PRACTICAL MODULE

PART-A

1. Write a Python program that evaluates an application UI based on Jakob Nielsen's 10 usability heuristics. The program should allow the user to rate each heuristic on a scale of 1–5 and compute an overall usability score with interpretation.
2. Create a simple simulated chatbot. Test two types of responses (short vague vs detailed informative). Ask users to choose which is more usable, and display a result summary.
3. Design a CLI or basic GUI app that takes a user's sentence (e.g., "I'm frustrated") and applies sentiment analysis to recommend a suitable UI theme (e.g., calming color, simpler layout, larger font).
4. Create a GUI-based form using Tkinter with fields for Name, Email, and Password. Validate inputs and show appropriate error messages for incorrect entries (e.g., invalid email, weak password).
5. Write a Python script that displays two different UI layouts (A/B testing) to users and logs their preferences. Generate a summary report showing which layout is more preferred.
6. Implement a Python program that records mouse movements and click coordinates on a UI, and visualizes a heatmap of user attention areas using libraries like seaborn.
7. Design a Python program that adapts UI themes and layouts dynamically (e.g., dark mode at night, layout changes based on usage patterns).
8. Create a Python program that logs user interactions like button clicks and form submissions, and displays real-time analytics using a graphical dashboard.

PART- B (Open-Ended Experiment)

9. Design a Python-based application that detects user emotion through typed input or emoji selection and adapts the UI layout, theme, or messages accordingly.
10. Develop a Python-based UI that rewards users with points, badges, or levels based on their interactions (e.g., completing forms, frequent usage, clicking helpful elements). Maintain state across sessions.

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

22CBS72.1	Demonstrate usability principles, design guidelines, and legal considerations to evaluate interactive systems.
22CBS72.2	Implement data gathering, analysis, and presentation techniques to extract meaningful UX insights.
22CBS72.3	Utilize UX concepts, components, and design methodologies to develop effective user interactions.
22CBS72.4	Analyze Agile UX lifecycle models and generative design techniques to improve usability and user experience.
22CBS72.5	Evaluate user needs and interaction requirements to develop effective conceptual and interaction design models.
22CBS72.6	Design user-centered software applications by integrating usability principles, UX methodologies, and Agile design practices.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Designing the User Interface	Shneiderman, Plaisant, Cohen, Jacobs, Elmqvist	Pearson	6 th Edition, 2018

2	Interaction Design: Beyond Human-Computer Interaction	Jennifer Preece, Helen Sharp, Yvonne Rogers	John Wiley & Sons	6 th Edition, 2023
3	Agile UX Design for a Quality User Experience	Rex Hartson, PardhaPyla	Imprint: Morgan Kaufmann	2 nd Edition, 2018
Reference Books				
1	The Design of Everyday Things	Donald A Norman, Currency and Doubleday	Basic Books	1 st Edition, 2014
2	About Face: The Essentials of Interaction Design	Alan Cooper, Robert Reimann, David Cronin, Christopher Noessel	Wiley	4 th Edition, 2014
3	Don't Make Me Think: A Common Sense Approach to Web Usability	Steve Krug	New Riders	3 rd Edition, 2013
4	Human-Computer Interaction	Alan Dix, Janet E. Finlay, Gregory D. Abowd, Russell Beale	Pearson	3 rd Edition, 2003

Web links and Video Lectures (e-Resources):

- <https://www.youtube.com/watch?v=EdeqHA8Pfk0>
- <https://www.youtube.com/watch?v=mnrelON2p8M>
- <https://www.youtube.com/watch?v=CJnfAXlBRTE>
- <https://www.youtube.com/watch?v=xzKCYmD5Z1I>
- <https://www.youtube.com/watch?v=1v9maizrAbQ>

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
22CBS72.1	3	2	-	-	-	-	-	-	-	-	2	-	-
22CBS72.2	-	2	2	-	-	-	-	1	-	-	2	3	-
22CBS72.3	-	-	3	-	2	-	-	-	1	-	-	2	-
22CBS72.4	-	2	3	-	-	-	-	-	-	-	2	-	2
22CBS72.5	-	2	-	3	-	-	-	-	-	-	-	3	-
22CBS72.6	-	3	-	3	-	-	-	-	-	-	3	-	3

1: Low 2: Medium 3: High

Cloud Computing			
Course Code	22CBS73	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE	3 Hours
Total Hours	40 Hours	Credits	03
Course Learning Objectives: The objective of the course is to • Introduce the rationale behind the cloud computing revolution and the business drivers. • Understand various models, types and challenges of cloud computing. • Understand the design of cloud native applications, the necessary tools and the design tradeoffs. • Realize the importance of Cloud Virtualization, Abstraction`s, Enabling Technologies and cloud security.			
Module-1: Foundations of Distributed and Cloud Systems.			8 hours
Distributed System Models and Enabling Technologies: Scalable Computing Over the Internet, Technologies for Network Based Systems, System Models for Distributed and Cloud Computing, Software Environments for Distributed Systems and Clouds. TB1: Ch. 1: 1.1 to 1.4			
Module-2: Virtual Machines and Virtualization of Clusters			8 hours
Virtual Machines and Virtualization of Clusters: Implementation Levels of Virtualization, Virtualization Structure/Tools and Mechanisms, Virtualization of CPU/Memory and I/O devices, Virtual Clusters and Resource Management. TB 1: Ch. 3: 3.1 to 3.4			
Module-3: Cloud Platform Architecture over Virtualized Datacenters			8 hours
Cloud Platform Architecture over Virtualized Datacenters: Cloud Computing and Service Models, Data Center Design and Interconnection Networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms: GAE, AWS and Azure. TB 1: Ch. 4: 4.1 to 4.4			
Module-4: Cloud Security			8 hours
Cloud Security: Security, The top concern for cloud users, Cloud Security Risks, Privacy Impact Assessment, Security of Database Services, Operating System security, Virtual Machine Security. Cloud Security and Trust Management: Cloud Security Defense Strategies, Distributed Intrusion/Anomaly Detection, Data and Software Protection Techniques, Reputation-Guided Protection of Data Centers. TB 2: Ch. 11: 11.1,11.2,11.3,11.6,11.7,11.8 TB 1: Ch. 4: 4.6			
Module-5: Cloud Programming and Software Environments			8 hours
Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, Parallel and Distributed Computing Paradigms, Programming Support for Google App Engine, Programming on Amazon AWS and Microsoft TB 1: Ch. 6: 6.1 to 6.4			
Course Outcomes: At the end of the course the student will be able to:			
22CBS73.1	Describe various cloud computing platforms and service providers.		
22CBS73.2	Illustrate the significance of various types of virtualizations.		

22CBS73.3	Identify the architecture, delivery models and industrial platforms for cloud computing-based applications.
22CBS73.4	Analyze the role of security aspects in cloud computing.
22CBS73.5	Demonstrate cloud applications in various fields using suitable cloud platforms.
22CBS73.6	Investigate emerging trends and best practices in cloud computing.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1.	Distributed and Cloud Computing	Kai Hwang, Geoffrey C Fox, and Jack J Dongarra	Morgan Kaufmann, Elsevier	2012
2.	Cloud Computing: Theory and Practice	Dan C Marinescu	Morgan Kaufmann, Elsevier	3 rd Edition, 2023
Reference Books				
1	Cloud Computing Implementation, Management and Security	John W Rittinghouse, James F Ransome	CRC Press	2013
2	Computing Principles and Paradigms	RajkumarBuyya , James Broberg, Andrzej Goscinsk,	John Wiley & Sons	2014

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=EN4fEbcFZ_E
- <https://www.youtube.com/watch?v=RWgW-CgdIk0>
- <https://www.geeksforgeeks.org/virtualization-cloud-computing-types/>
- <https://www.tpointhtech.com/cloud-service-provider-companies>
- <http://www.digimat.in/nptel/courses/video/106105167/L01.html>

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
22CBS73.1	1	2	-	-	-	-	-	-	-	-	-	-	-
22CBS73.2	2	1	-	-	1	-	2	-	-	2	-	-	-
22CBS73.3	-	2	2	-	2	-	2	-	-	3	-	2	-
22CBS73.4	-	-	1	-	1	2	-	-	-	2	-	-	-
22CBS73.5	-	-	-	-	2	-	2	-	-	2	-	-	-
22CBS73.6	-	2	3	-	-	-	-	-	-	-	-	-	3

1: Low 2: Medium 3: High

Total Quality Management			
Course Code	22CBS741	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE	3 Hours
Total Hours	40 Hours	Credits	03
Course Learning Objectives: The objective of the course is to • Explain the significance of quality concepts, dimensions, and philosophies in engineering and manufacturing. • Utilize tools like Statistical Process Control (SPC), Quality Function Deployment (QFD), and Taguchi methods to enhance product and process quality. • Understand and apply ISO standards, Total Productive Maintenance (TPM), and benchmarking for organizational excellence. • Apply statistical methods, control charts, and data-driven approaches to measure, monitor, and improve quality.			
Module-1: TQM Principles			8 hours
Quality Concepts – Definition of Quality, Dimensions of Quality, Cost of Quality and Quality Gurus. TQM Philosophy – Principles of TQM, Deming’s Philosophy, Juran’s Philosophy & Crosby’s Philosophy.			
Module-2: Design for Quality			8 hours
Detailed Design – Product Development & Quality Function Deployment (QFD), Target and Tolerance Design, Taguchi Loss Function for Tolerance Design. Design for Reliability – Mathematics of Reliability & System Reliability. Design Optimization – Fault Tree Analysis, Design for manufacturability, environment responsibility and excellence.			
Module-3: Measuring & Controlling the Quality			8 hours
Statistical Fundamentals – Sampling Distributions, Confidence Intervals, Measures of Central Tendency and Dispersion, Population and Sample, Normal Curve. Measuring the Quality – Measurement of Quality control, system evaluation and process capability measurement. Controlling the Quality – Statistical Process Control for Variables & Attributes (No numerical).			
Module-4: Analysis & Improve the Quality			8 hours
Seven QC Tools – Stratification, Check Sheets, Control Chart, Histogram, Pareto Chart, Cause and-effect diagram & Scatter diagram. New Management and planning tools – 5 Why Analysis, Affinity Diagram, Interrelationship Digraph & Tree Diagram, Matrix Diagram, Matrix Data Analysis, Process Decision Program Chart and Arrow Diagram.			
Module-5: Improve for Quality Excellence (TPM)			8 hours
Continuous Process Improvements – Benchmarking, PDCA Cycle, 6S, Kaizen, Lean and Six Sigma principles. Leadership – Characteristics of Quality Leaders, The 7 Habits of Highly Effective People.			

Course Outcomes: At the end of the course the student will be able to:	
22CBS741.1	Apply TQM principles and philosophies to solve quality problems in engineering and manufacturing systems.
22CBS741.2	Develop product and process designs using Quality Function Deployment (QFD), Taguchi Methods, and reliability analysis for robust engineering solutions.
22CBS741.3	Apply statistical methods and control charts to measure, monitor, and control quality performance in processes and systems.
22CBS741.4	Analyze quality data using Seven QC tools and new management planning tools to identify root causes and implement improvements.
22CBS741.5	Design and implement continuous improvement strategies such as Benchmarking, Kaizen, Lean, and Six Sigma for quality excellence in

	organizations.
22CBS741.6	Apply statistical tools and quality techniques to Create a comprehensive and effective Total Quality Management system.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Managing for Quality and Performance Excellence	James R Evans and William	Cengage Learning	9 th Edition, 2013
2	An Introduction to Six Sigma and Process Improvement	James R. Evans, William M. Lindsay	Cengage Learning	2 nd Edition , 2014
Reference Books				
1	Total Quality Management	Dale H. Besterfield, Carol Besterfield Michna, et.al	Pearson	3 rd Edition, 2012
2	Total Quality Management	Suganthi.L and Anand Samuel	Prentice Hall (India) Pvt. Ltd	7 th Edition, 2006
3	Total Quality Management – Text and Cases	Janakiraman. B and Gopal.R.K	Prentice Hall (India) Pvt. Ltd.	Eastern Economy Edition, 2006

Web links and Video Lectures (e-Resources):

- <https://youtu.be/3d6DsjlBzJ4>
- <https://archive.nptel.ac.in/courses/111/106/111106100/>
- https://youtu.be/7MmhoqvM9_Q
- <https://youtu.be/Mj3y5B5voNk>
- <https://www.youtube.com/watch?v=btOCUmJkrrg>
- <https://www.youtube.com/watch?v=OBhZvyhc8JQ>
- <https://www.youtube.com/watch?v=7vwDp94wEhg>
- <https://www.youtube.com/watch?v=HOXWRNuH3BE>
- <https://www.youtube.com/watch?v=oPkTasoJngA>
- <https://www.youtube.com/watch?v=gxy6VI1hEfs>

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
22CBS741.1	3	-	-	-	-	-	-	-	2	-	-	-	-
22CBS741.2	-	-	3	-	-	-	-	-	-	-	2	-	-
22CBS741.3	-	-	-	3	2	-	-	-	-	-	-	-	-
22CBS741.4	-	3	-	-	-	2	-	2	-	-	-	-	-
22CBS741.5	-	-	3	-	-	-	-	-	-	2	-	-	-
22CBS741.6	-	3	-	-	-	-	2	-	-	-	-	-	-

1: Low 2: Medium 3: High

Social Network Analysis			
Course Code	22CBS742	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE	3 Hours
Total Hours	40 Hours	Credits	03
Course Learning Objectives: The objective of the course is to • Explain the fundamental components and structure of social networks. • Model social networks to understand their structure and significance. • Describe the influence of social networks on individuals and society. • Explain the evolution and growth patterns of social network communities over time. • Examine real-time applications of social network analysis across various domains.			
Module-1: Introduction			8 hours
Introduction to Social Networks: Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis- Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis. TB1: Ch. 1,2,3 TB2:Ch. 1			
Module-2: Knowledge Representation			8 hours
Knowledge Representation: Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data. TB1: Ch. 4,5			
Module-3: Extraction and Mining Communities			8 hours
Extraction and Mining Communities: Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social network TB2: Ch. 6,12,17			
Module-4: Prediction of Human Behavior			8 hours
Prediction of Human Behavior: Understanding and predicting human behavior for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation – Trust derivation based on trust comparisons - Attack spectrum and countermeasures TB2: Ch. 20,23			
Module-5: Visualization and Applications of Social Networks			8 hours
Visualization and Applications of Social Networks: Graph theory - Centrality - Clustering - Node-Edge Diagrams – Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams – Hybrid representations - Applications - Cover networks - Community welfare -Collaboration networks – Co Citation networks TB2: Ch. 27,28,29			

Course Outcomes: At the end of the course the student will be able to:				
22CBS742.1	Explain the significance of social network analysis techniques in web-based networks.			
22CBS742.2	Describe Ontology-based knowledge representation techniques for structured analysis of social networks			
22CBS742.3	Identify community detection and mining techniques across diverse social network infrastructures to exhibit meaningful patterns and relationships.			
22CBS742.4	Interpret the user behavior in social communities like trust, privacy, and security in online networks using data-driven and trust-based models.			
22CBS742.5	Illustrate social networks through graph theory and visualization methods applied to real-world contexts.			
22CBS742.6	Implement social network analysis for real-world social networks.			
Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Social Networks and the Semantic Web	Peter Mika	Semantic Web and Beyond	1 st Edition, 2007
2	Handbook of Social Network Technologies and Applications	Borko Furht	Springer	1 st Edition, 2010
Reference Books				
1	Web Mining and Social Networking – Techniques and applications	Guandong Xu, Yanchun Zhang and Lin Li	Springer	1 st Edition, 2011
2	Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively	Dion Goh and Schubert Foo	IGI Global Snippet	2008
3	Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling	Max Chevalier, Christine Julien and Chantal Soulé-Dupuy	IGI Global Snippet	2009
4	The Social Semantic Web	John G. Breslin, Alexander Passant and Stefan Decker	Springer	2009

Web links and Video Lectures (e-Resources):	
• https://www.youtube.com/watch?v=KRX8MqtPI4g • https://www.youtube.com/watch?v=lnLW6ITFY3M • https://www.youtube.com/watch?v=JFIYwj1Ph-g • https://www.youtube.com/watch?v=HO44OJWsL5o • https://www.youtube.com/watch?v=IpkBw_e-qdY&list=PLv4HhF8dU0AEaYsDHC6L2ofqFvFuOq5w • https://www.youtube.com/watch?v=bMwy11xUQC0 • https://www.youtube.com/watch?v=cCI8PKHAFQ • https://www.youtube.com/watch?v=zd2Cb2_3YGI • https://www.youtube.com/watch?v=kJDkzIvp_J8 • https://www.youtube.com/watch?v=ZJa4RRTVxlc	

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
22CBS742.1	3	-	-	-	-	-	-	-	-	-	-	-	-
22CBS742.2	-	2	1	-	-	-	-	-	-	-	-	-	-
22CBS742.3	2	-	1	-	-	1	-	-	-	-	-	-	-
22CBS742.4	-	2	-	-	-	1	-	-	-	-	-	-	-
22CBS742.5	2	-	-	-	-	1	-	-	-	-	-	1	-
22CBS742.6	-	2	-	-	1	-	-	-	-	-	-	1	-

1: Low 2: Medium 3: High

Supply Chain Management			
Course Code	22CBS743	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE	3 Hours
Total Hours	40 hours Theory	Credits	03
Course Learning Objectives: The objective of the course is to • Explain the process and functions of Supply Chain Management • Examine the design and network in Supply Chain Management • Describe the objectives of transportation infrastructure policy & trade-off • Understand the role of coordination in Supply Chain management, building partnership and trust.			
Module-1: Introduction to Supply Chain Management			8 hours
Introduction: Meaning of Supply Chain Management, Decision phases of Supply Chain Management, Process View of Supply Chain Management, Strategies of Supply Chain Management: Competitive supply chain strategies, achieving strategic Fit, Obstacles, Strategic Supply Chain decisions, Managing Supply chain performance. TB1: Ch. 1,2			
Module-2: Designing the Supply Chain Network			8 hours
Distribution Network, Factors influencing a distribution network, Managing Distribution Network, E-business and its impact on supply chain, Designing the distribution network: Introduction, Design options for Distribution Network, Process of distribution network design, Framework for network design, Modelling the supply chain. TB1: Ch. 4,5			
Module-3: Planning Demand and Supply, Inventories planning			8 hours
Demand Forecasting in Supply Chain Management: Meaning of demand forecasting, methods, a systematic approach, Planning and managing safety inventory: Safety inventory in Supply chain, Vendor managed inventory, Aggregate Planning: Meaning, aggregate planning strategies, Information Technology in Supply chain: IT and Supply Chain, IT framework of Supply Chain. TB1: Ch. 6 TB2: Ch. 7			
Module-4: Transportation Networks and Sourcing			8 hours
Introduction, meaning of transportation, Transportation design, Tailored transportation, sourcing in Supply Chain Management: Meaning of Sourcing, Role of Sourcing in Supply Chain, In-House sourcing and Outsourcing, Third- and Fourth-party Logistics providers, Supplier Scoring and Assessment. TB1: Ch. 10,11 TB2: Ch. 14			
Module-5: Price Management & Coordination in Supply Chain			8 hours
Pricing and revenue management in supply chain management, multiple customer segments, Seasonal demands, for bulk and spot contracts, Process of revenue management. E-coordination in supply chain: Meaning of coordination, obstacles, building partnership and trust, Continuous replenishment and vendor managed inventory, CPFR and its benefits. TB1: Ch. 12,13			

Course Outcomes: At the end of the course the student will be able to:	
22CBS743.1	Explain the barriers in Supply Chain Management and examine the strategies.
22CBS743.2	Describe the advantages & disadvantages of E-business, examine the concept of network design and role of network in supply chain.
22CBS743.3	Explain the different design plan options and trade- offs, transportation modes.

22CBS743.4	Interpret the revenue management for multiple customers and benefits of outsourcing.
22CBS743.5	Examine the activities in continuous replenishment program, countermeasures of SCM.
22CBS743.6	Analyze role of logistics in business strategy and supply chain operations, including key logistics functions and their interrelationships.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Supply Chain Management	Sahay	Macmillan Publishers India	2 nd Edition, 2004
2	Supply Chain Management: Strategy, Planning and Operation	Sunil Chopra Dharam Vir Kalra Gourav Dwivedi	Pearson Education	7 th Edition, 2024
Reference Books				
1	Supply Chain Management	Albert Fernandes	Discovery Publishing House (India)	1 st Edition, 2023
2	Basic Principles Of Supply Chain Management	Singh Y	Raj Publications	1 st Edition, 2010
3	Principles of Supply Chain Management	Wisner Joel	Cengage Learning, Inc	1 st Edition, 2022

Web links and Video Lectures (e-Resources):

- <https://www.youtube.com/watch?v=qwq9QhL2HBo>
- <https://www.youtube.com/watch?v=9BsRSqzrXCA>
- <https://www.youtube.com/watch?v=IZPO5RclZEo>
- <https://www.youtube.com/watch?v=M11QBxVjZAw>
- <https://www.youtube.com/watch?v=raqi4gjMLm8>
- https://www.youtube.com/watch?v=qahtk6gvk_4
- <https://www.youtube.com/watch?v=1POA8UyZLDY>

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
22CBS743.1	2	-	1	-	-	-	-	-	-	-	-	1	-
22CBS743.2	2	2	-	-	2	-	-	-	-	-	-	1	-
22CBS743.3	-	-	2	-	3	-	-	-	-	-	-	1	-
22CBS743.4	1	-	-	-	1	-	-	-	-	-	-	1	-
22CBS743.5	3	-	-	-	-	-	-	-	-	-	-	1	-
22CBS743.6	3	-	-	1	2	-	-	-	-	-	-	1	-

1: Low 2: Medium 3: High

Augmented and Virtual Reality			
Course Code	22CBS744	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE	3 Hours
Total Hours	40 Hours	Credits	03
Course Learning Objectives: The objective of the course is to • Understand the fundamentals of Virtual Reality (VR) and its key components. • Explore input and output devices used in VR, including trackers, displays, and haptic feedback. • Differentiate between Virtual Reality (VR) and Augmented Reality (AR) technologies. • Apply modeling techniques for interactive VR and AR environments. • Evaluate human factors, safety concerns, and applications of VR/AR in various fields.			
Module-1: Introduction to Augmented and Virtual Reality			8 hours
Introduction: What is Augmented Reality? Augmented Reality Concepts, The three I's of virtual reality, commercial VR technology and the five classic components of a VR system. Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark. TB1: Ch. 1 TB2: Ch. 1, 2			
Module-2: Input and Output Devices			8 hours
Input Devices: (Trackers, Navigation, and Gesture Interfaces): Three-dimensional position trackers, Navigation and Manipulation, Gesture interfaces. Output Devices: Graphics displays, Sound displays, Haptic feedback. TB1: Ch. 2, 3			
Module-3: AR/VR System Architecture and Modeling Techniques			8 hours
Computing Architectures for VR: The Rendering Pipeline, PC Graphics Architecture, Workstation-Based Architectures, Distributed VR Architectures Modeling: Geometric modeling, Kinematics modeling, Physical modeling, Behavior modeling, Model management. TB1: Ch. 4, 5			
Module-4: VR Programming			8 hours
Toolkits and Scene Graphs, World Toolkit, Java 3D, General Haptics Open Software Toolkit, PeopleShop. TB1: Ch. 6			
Module-5 Human Factors and Applications			8 hours
Human Factors: Methodology and terminology, User performance studies, VR health and Safety issues. Traditional VR Applications: Medical applications, Education, Arts, and Entertainment, Military applications. Emerging Applications of VR: VR Applications in Manufacturing, Applications of VR in Robotics, Information Visualization. TB1: Ch. 7, 8, 9			

Course Outcomes: At the end of the course the student will be able to:	
22CBS744.1	Explain the fundamental principles, concepts, and historical development of AR/VR.
22CBS744.2	Identify and compare various input and output devices used in VR systems.
22CBS744.3	Apply VR programming techniques using toolkits to develop interactive virtual environments.
22CBS744.4	Design and manage models in VR/AR systems using modeling approaches.

22CBS744.5	Analyze human factors, safety issues, and VR/AR applications in diverse fields.
22CBS744.6	Integrate knowledge of AR/VR technologies to develop innovative solutions for real-world applications

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Virtual Reality Technology	Grigore C. Burdea, Philippe Coiffet	John Wiley & Sons	2 nd Edition, 2003
2	Understanding Augmented Reality, Concepts and Applications	Alan B. Craig	Morgan Kaufmann	1 st Edition, 2013
Reference Books				
1	Virtual Reality	Steven M. LaValle	Cambridge University Press	1 st Edition, 2016
2	Spatial Augmented Reality: Merging Real and Virtual Worlds	Oliver Bimber and Ramesh Raskar	A K Peters, Ltd.	1 st Edition, 2005

Web links and Video Lectures (e-Resources):

- https://youtu.be/Mu5wyuqmqXI?si=_ivff3sI4kJYalhW
- <https://youtu.be/04AMaTsXFJU?si=WIE53wbhYtLdGWG>
- https://youtu.be/QpbJwad6v_s?si=8fb3aADTONFQU7nO
- <https://youtu.be/sfsHfCAOBuQ?si=lGzWsZ0X3GoGBzsD>
- <https://youtu.be/XLP4YTpUpBI?si=4yAuacr3AxQShSvm>
- <https://www.geeksforgeeks.org/virtual-reality-augmented-reality-and-mixed-reality/>
- <https://www.intel.com/content/www/us/en/tech-tips-and-tricks/virtual-reality-vs-augmented-reality.html>
- <https://forwork.meta.com/blog/difference-between-vr-ar-and-mr/>

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
22CBS744.1	3	-	-	-	2	-	-	-	-	-	-	-	2
22CBS744.2	3	-	-	2	-	-	-	-	-	-	-	-	2
22CBS744.3	-	2	-	2	-	-	-	-	-	-	-	-	3
22CBS744.4	3	-	2	-	2	-	-	-	-	-	-	-	2
22CBS744.5	-	2	-	2	-	-	-	-	-	-	-	-	2
22CBS744.6	3	-	-	-	-	-	2	-	-	-	-	-	1

1: Low 2: Medium 3: High

Major Project Phase II			
Course Code	22CBS75	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Practical	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	(0:0:6)	SEE	3 Hrs
Total Hours	72 hours	Credits	06
Course Learning Objectives:			
- Utilize fundamental principles of engineering and interdisciplinary knowledge to identify, analyse, and solve complex problems in the project domain. - Develop and execute a comprehensive project plan that includes designing, prototyping, testing, and evaluating a system, component, or process to meet specific needs and constraints. - Conduct in-depth research, critically review literature, and integrate innovative solutions or techniques within the project framework. - Demonstrate effective teamwork, communication, and collaboration skills in a multidisciplinary environment to achieve project objectives. - Incorporate ethical considerations, societal impact, and sustainable practices in the project development, while adhering to professional engineering standards. - Prepare and present a well-structured project report, supported by technical documentation and visual aids, and confidently defend the work during project viva-voce or presentations.			
1. Project Execution			
Regular Meetings: Students should meet regularly with their project-guide to discuss progress, challenges, and next steps. Documentation: Maintain detailed documentation throughout the project in a project work-dairy, including design decisions, experiments, and testing results. Milestones: Set clear milestones and deadlines to ensure steady progress. These could include design completion, initial prototype, testing, etc.			
2. Mid-term Review			
Progress Presentation: DPEC shall conduct a mid-term review where students present their progress to a panel of faculty members. Feedback: Provide constructive feedback and guidance to help students refine their projects.			
3. Final Submission			
Report: The project report should include an abstract, introduction, literature review, methodology, implementation, results, discussion, conclusion, and references. Code and Data: If applicable, students should submit their code, datasets, and any other relevant materials.			
4. Project Presentations			
Oral Presentation: Students should present their projects to a panel, explaining their work, findings, and contributions. Demonstration: If possible, include a live demonstration of the project or show relevant simulations and results. Q&A: Be prepared to answer questions from the panel and justify the project's methodology and conclusions.			
5. Evaluation Criteria			
Originality and Innovation: Assess the novelty and creativity of the project. Technical Competence: Evaluate the depth of technical knowledge and problem-solving ability demonstrated. Project Execution: Consider the effectiveness of project planning, adherence to timelines, and quality of implementation. Presentation and Communication: Judge the clarity and coherence of the final report, presentation, and the ability to answer questions.			

6. Plagiarism Check	
• Academic Integrity: Ensure that the work submitted is original and properly cites all references and sources. • Plagiarism Check: Run all reports through plagiarism detection software and ensure that similarity index is less than the threshold value (25%).	
7. Mentorship and Feedback	
• Feedback: Students are required to consult with their project guide regularly throughout the project work to seek guidance and feedback. • Weekly Meetings: At least one mentorship meeting every week shall be held and recorded in the project work-dairy.	
8. Post Submission	
• Publication: DPEC shall encourage students to publish their work in conferences or journals, especially if it contributes significantly to their field. • Project Archive: Store all projects in the department's digital archive for future reference.	

Continuous Internal Evaluation (CIE)		
Description	Proposed Dates	Max Weightage (max 100 marks)
Project Progress Evaluation -I	beginning of the 7 th Semester	20 marks
Project Progress Evaluation -II	middle of the 7 th Semester	30 marks
Project Report Evaluation (Phase II)	end of the 7 th Semester	50 marks
Semester End Examinations (SEE)		
SEE will be conducted for 100 marks (after the last working day of the 7 th semester) in the presence of the external examiner with the weightage as Project Report: 50 marks, Project Presentation: 25 marks and Question & Answer Session: 25 marks. Marks awarded for Project Report is same for all batch-mates.		

Course Outcomes: At the end of the course the student will be able to :	
22CBS75.1	Demonstrate the ability to identify, define, and solve complex engineering problems using appropriate methodologies and modern tools.
22CBS75.2	Successfully design, develop, and test an engineering solution that meets specified requirements, addressing technical, economic, environmental, and social constraints.
22CBS75.3	Apply research skills to review existing literature, gather and analyze data, and incorporate innovative or state-of-the-art technologies in the project
22CBS75.4	Collaborate effectively within a team, taking on leadership or supportive roles as needed, while ensuring clear communication and efficient project management.
22CBS75.5	Demonstrate awareness of professional ethics, societal impact, and sustainability in the design and implementation of engineering solutions.
22CBS75.6	Exhibit strong written and oral communication skills by preparing technical reports, project documentation, and delivering persuasive project presentations.

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
22CBS75.1	2	3	-	-	1	-	-	-	-	-	-	-	-
22CBS75.2	-	-	3	-	-	2	1	-	-	-	-	-	-
22CBS75.3	1	2	-	3	-	-	-	-	-	-	-	-	-
22CBS75.4	-	-	-	-	-	1	-	-	3	2	2	-	-
22CBS75.5	-	-	1	-	-	-	2	3	-	-	-	-	-
22CBS75.6	-	-	-	-	-	-	-	-	-	3	2	-	-

1: Low 2: Medium 3: High

VIII Semester

Professional Elective – IV (Online Course)			
Course Code	22CBS81	CIE Marks	50 *
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50 *
		Total Marks	100
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE	3 Hrs
Total Hours	36 hours	Credits	03

Course Learning Objectives: The objective of the course is to

- Understand and apply foundational concepts and principles of the chosen elective domain to real-world engineering problems.
- Develop the ability to learn independently and navigate MOOC platforms effectively to acquire domain-specific knowledge and skills.
- Demonstrate analytical and problem-solving abilities by engaging in course assessments, simulations, case studies, or project-based activities.
- Interpret and evaluate course content critically from multiple sources including video lectures, reading materials, and peer discussions.
- Integrate interdisciplinary knowledge gained from the MOOC into core engineering subjects for innovative applications or design thinking.
- Communicate technical ideas and solutions effectively, both in written and oral form, based on the knowledge acquired through the online course.

*Note: In case of MOOCs certificates submitted by the students, the marks/grade shall be awarded based on the percentage of marks/grade reflected in the certificates.

1. Selection of MOOCs

1.1 Accredited Platforms: Students shall select MOOCs from accredited platforms such as Coursera, edX, SWAYAM/NPTEL, Udacity, or any online learning platform recognized by the respective Engineering Department / Board of Studies (BoS). Engineering Departments with the approval of BoS shall publish a list of MOOCs courses in the beginning of every semester/academic session.

1.2 Prerequisites: Students shall ensure that he/she has completed any foundational courses or prerequisites required for the chosen MOOCs.

1.3 Relevant Courses: Students shall choose courses that are relevant to the Student's Engineering discipline and career goals. Students shall NOT opt for the course which is part of their curriculum (I to VIII semester B.E program) and Honors Degree/Minor Degree courses. In case of any overlapping in the contents of the MOOC Course with that in the curriculum or other courses, the maximum permitted overlapping in the course contents (syllabus) is 20-25%.

1.4 Credit Value: Students shall ensure that the selected MOOCs collectively account for 3 credits. Typically, a 3-credit MOOC will require around 35-40 hours of study, a 2-credit MOOC will require around 20-25 hours of study and a 1-credit MOOC will require 10-12 hours of study.

1.5 Duration of Course: A 4-weeks MOOCs is eligible for 1-credit. Students are advised to enroll for one 12-weeks MOOCs course to earn 3 credits. However, Students can also take one 8-weeks MOOCs + one 4-weeks MOOCs instead of one course. In each case, the number of hours of study mentioned shall be satisfied. The total performance in the MOOCs will be average of performances considering both MOOCs courses.

2. Approval Process

2.1 Pre-Approval: Students must seek pre-approval from the Department MOOCs Coordinator before enrolling in MOOCs.

2.2 Submission of Proposal: Students can submit a detailed proposal to Department MOOCs Coordinator including the name of the MOOCs, the platforms, course duration, credit value, and relevance to their field of study.

If a Student has already completed any MOOCs course/s from the beginning of the III semester B.E, that satisfies the criteria mentioned in the clause 1. Selection of MOOCs, such course/s can be considered by the Department for credit transfer, provided the student has NOT already claimed the benefit of completing the MOOCs under any assessment in any of the subject.

2.3 Evaluation: The Department will evaluate the proposal for relevance, academic rigor, and credit equivalence and will communicate the decision to the Students.	
3. Registration and Enrollment	
3.1 Official Enrollment: Students shall register for the approved MOOCs on the respective platforms.	
3.2 Documentation: Students shall keep documentation of registration and course details for future reference and provide the same when asked by the Department.	
4. Course Completion	
4.1 Active Participation: Students shall engage actively in all course activities including lectures, assignments, quizzes, and discussion forums.	
4.2 Completion Certificate: Students shall obtain a verified certificate of completion for MOOC Course. Free versions without certificates are NOT eligible for credit.	
5. Assessment and Evaluation	
5.1 Performance Tracking: Students shall maintain records of performance in all assessments throughout the course.	
5.2 Final Assessment: The Department may conduct a final assessment (proctored exam) to ensure that the knowledge gained aligns with the academic standards. This summative assessment (proctored exam) by the Engineering Department is mandatory in the absence of such assessment in the MOOC course/s by the online platform.	
6. Credit Transfer	
6.1 Submission of Certificates: Students shall submit the completion certificate/s and performance records to the Department MOOCs Coordinator.	
6.2 Credit Evaluation: The Department will evaluate the certificates and performance records to approve the credit transfer.	
6.3 Grade Conversion: College will take care to convert the grades from the MOOCs into the grading system as per established Academic Rules and Regulations.	
7. Integration into Academic Record	
7.1 Transcript Update: Upon approval, the credits and grades will be integrated into the student's academic transcript.	
7.2 Grade Point Average (GPA) Calculation: The MOOC grades are included in the calculation of the student's GPA.	
8. Support and Resources	
8.1 Academic Advising: The Department MOOCs Coordinator shall provide guidance and support to the students throughout the process.	
8. 2 Technical Support: The Department MOOCs Coordinator shall ensure that students have access to the necessary technical resources to complete MOOCs courses.	
9. Feedback and Improvement	
9.1 Student Feedback: Department MOOCs Coordinator shall collect feedback from students on their MOOC experiences to improve future implementations.	
9.2 Continuous Improvement: MOOCs guidelines and processes will be updated based on student feedback, Department feedback and evolving educational standards.	

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

22CBS81.1	Demonstrate comprehensive understanding of the key concepts, tools, and techniques in the chosen elective domain.
22CBS81.2	Apply the acquired knowledge to solve domain-specific engineering problems using appropriate methods and tools.
22CBS81.3	Analyze and interpret information from MOOC resources to support decision-making and problem-solving.
22CBS81.4	Exhibit self-directed learning skills and effective time management to complete the MOOC as per defined timelines.

22CBS81.5	Collaborate and communicate effectively in online learning environments through discussions, peer reviews, and group tasks (if applicable).
22CBS81.6	Integrate the knowledge gained from the MOOC into interdisciplinary engineering contexts and reflect on its professional relevance.

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
22CBS81.1	3	2	-	-	1	-	-	-	-	-	-	-	-
22CBS81.2	3	-	2	-	-	-	-	-	-	-	2	-	-
22CBS81.3	-	-	-	-	3	-	-	-	-	-	2	-	-
22CBS81.4	3	-	-	-	2	-	-	-	-	-	1	-	-
22CBS81.5	-	-	-	-	-	-	-	-	2	3	1	-	-
22CBS81.6	3	-	-	-	-	2	-	-	-	-	1	-	-

1: Low 2: Medium 3: High

Open Elective – II (Online Course)			
Course Code	22CBS82	CIE Marks	50*
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50*
		Total Marks	100
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE	3 Hrs
Total Hours	36 hours	Credits	03

Course Learning Objectives: The objective of the course is to

- Gain foundational and interdisciplinary knowledge in a subject outside the core engineering specialization to promote broader intellectual development.
- Understand key theories, models, and practices related to the open elective topic, as delivered through MOOC lectures, readings, and assessments.
- Develop the ability to learn independently and manage learning schedules, leveraging the flexibility of the MOOC platform.
- Apply the acquired knowledge to real-world contexts, demonstrating the relevance of interdisciplinary learning to personal, professional, or societal challenges.
- Enhance digital learning competencies, including navigating online resources, participating in online discussions, and completing online assessments effectively.
- Foster critical thinking, creativity, and lifelong learning mindset by exploring new domains and expanding personal and professional interests.

*Note: In case of MOOCs certificates submitted by the students, the marks/grade shall be awarded based on the percentage of marks/grade reflected in the certificates.

1. Selection of MOOCs

1.1 Accredited Platforms: Students shall select MOOCs from accredited platforms such as Coursera, edX, SWAYAM/NPTEL, Udacity, or any online learning platform recognized by the respective Engineering Department / Board of Studies (BoS). Engineering Departments with the approval of BoS shall publish a list of MOOCs courses in the beginning of every semester.

1.2 Prerequisites: Students shall ensure that he/she has completed any foundational courses or prerequisites required for the chosen MOOCs.

1.3 Relevant Courses: Students shall choose courses that are relevant to the Student's Engineering discipline and career goals. Students shall NOT opt for the course which is part of their curriculum (I to VIII semester B.E program) and Honors Degree/Minor Degree courses. In case of any overlapping in the contents of the MOOC Course with that in the curriculum or other courses, the maximum permitted overlapping in the course contents (syllabus) is 20-25%.

1.4 Credit Value: Students shall ensure that the selected MOOCs collectively account for 3 credits. Typically, a 3-credit MOOC will require around 35-40 hours of study, a 2-credit MOOC will require around 20-25 hours of study and a 1-credit MOOC will require 10-12 hours of study.

1.5 Duration of Course: A 4-weeks MOOCs is eligible for 1-credit. Students are advised to enroll for one 12-weeks MOOCs course to earn 3 credits. However, Students can also take one 8-weeks MOOCs + one 4-weeks MOOCs instead of one course. In each case, the number of hours of study mentioned shall be satisfied. The total performance in the MOOCs will be average of performances considering both MOOCs courses.

2. Approval Process

2.1 Pre-Approval: Students must seek pre-approval from the Department MOOCs Coordinator before enrolling in MOOCs.

2.2 Submission of Proposal: Students can submit a detailed proposal to Department MOOCs Coordinator including the name of the MOOCs, the platforms, course duration, credit value, and relevance to their field of study.

If a Student has already completed any MOOCs course/s from the beginning of the III semester B.E, that satisfies the criteria mentioned in the clause 1. Selection of MOOCs, such course/s can be considered by the Department for credit transfer, provided the student has NOT already claimed the benefit of completing the MOOCs under any assessment in any of the subject.

2.3 Evaluation: The Department will evaluate the proposal for relevance, academic rigor, and

credit equivalence and will communicate the decision to the Students.
3. Registration and Enrollment
3.1 Official Enrollment: Students shall register for the approved MOOCs on the respective platforms.
3.2 Documentation: Students shall keep documentation of registration and course details for future reference and provide the same when asked by the Department.
4. Course Completion
4.1 Active Participation: Students shall engage actively in all course activities including lectures, assignments, quizzes, and discussion forums.
4.2 Completion Certificate: Students shall obtain a verified certificate of completion for MOOC Course. Free versions without certificates are NOT eligible for credit.
5. Assessment and Evaluation
5.1 Performance Tracking: Students shall maintain records of performance in all assessments throughout the course.
5.2 Final Assessment: The Department may conduct a final assessment (proctored exam) to ensure that the knowledge gained aligns with the academic standards. This summative assessment (proctored exam) by the Engineering Department is mandatory in the absence of such assessment in the MOOC course/s by the online platform.
6. Credit Transfer
6.1 Submission of Certificates: Students shall submit the completion certificate/s and performance records to the Department MOOCs Coordinator.
6.2 Credit Evaluation: The Department will evaluate the certificates and performance records to approve the credit transfer.
6.3 Grade Conversion: College will take care to convert the grades from the MOOCs into the grading system as per established Academic Rules and Regulations.
7. Integration into Academic Record
7.1 Transcript Update: Upon approval, the credits and grades will be integrated into the student's academic transcript.
7.2 Grade Point Average (GPA) Calculation: The MOOC grades are included in the calculation of the student's GPA.
8. Support and Resources
8.1 Academic Advising: The Department MOOCs Coordinator shall provide guidance and support to the students throughout the process.
8. 2 Technical Support: The Department MOOCs Coordinator shall ensure that students have access to the necessary technical resources to complete MOOCs courses.
9. Feedback and Improvement
9.1 Student Feedback: Department MOOCs Coordinator shall collect feedback from students on their MOOC experiences to improve future implementations.
9.2 Continuous Improvement: MOOCs guidelines and processes will be updated based on student feedback, Department feedback and evolving educational standards.

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

22CBS82.1	Demonstrate a clear understanding of the fundamental concepts and frameworks in the selected open elective domain.
22CBS82.2	Apply interdisciplinary knowledge gained from the MOOC to analyze and address real-life or cross-domain problems.
22CBS82.3	Exhibit the ability to learn independently, manage time effectively, and complete the online course requirements within the stipulated duration.
22CBS82.4	Interpret and evaluate information from diverse MOOC resources (videos, readings, forums) to support critical analysis and decision-making.
22CBS82.5	Communicate insights, reflections, and applications of the course content

	effectively in written or multimedia formats.
22CBS82.6	Integrate the learning from the MOOC to enhance personal, academic, or professional development beyond the engineering curriculum.

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
22CBS82.1	3	-	-	-	1	-	-	-	-	-	2	-	-
22CBS82.2	3	2	-	-	-	-	-	-	-	-	1	-	-
22CBS82.3	-	-	-	-	3	-	-	-	-	-	2	-	-
22CBS82.4	3	-	-	-	2	-	-	-	-	-	1	-	-
22CBS82.5	-	-	-	-	-	-	-	-	2	3	1	-	-
22CBS82.6	3	-	-	-	-	2	-	-	-	-	1	-	-

1: Low 2: Medium 3: High

Research/Industry Internship			
Course Code	22CBS83	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Practical	SEE Marks	50
		Total Marks	100
Number of Weeks	14-16 Weeks	SEE	3 Hours
		Credits	10
Research Internship			
Course Learning Objectives:			
1. To equip students with the knowledge of fundamental research principles, methodologies, and techniques applicable to their engineering discipline. 2. To enable students to formulate research questions, design experiments or studies, and use appropriate data collection and analysis tools. 3. To foster the ability to think critically and innovatively while solving complex engineering problems during the research process. 4. To guide students in developing the skills necessary for writing clear and well-structured research reports, papers, and presentations. 5. To instill an understanding of ethical practices in research, including integrity, responsible data handling, and respect for intellectual property. 6. To prepare students to work effectively in research teams, communicate their ideas clearly, and present their findings to both technical and non-technical audiences.			
Pre-Internship Preparation			
1. Orientation Session: Attend an orientation session with the academic mentor (allotted from the Department) and the Research Supervisor to understand the research goals, expectations, and assessment criteria. 2. Documentation: Complete necessary documentation, including the approval from the Department, processing of the internship request application, research agreements and confidentiality agreements, if applicable. 3. Research Proposal: Develop a research proposal in consultation with the Research Supervisor and academic mentor outlining the objectives, methodology, and expected outcomes.			
During the Internship			
1. Work Plan: Follow a structured research plan provided by the supervising researcher or mentor. 2. Literature Review: Conduct a comprehensive literature review to understand the current state of research in the chosen area. 3. Regular Meetings: Participate in regular meetings with academic and research mentors to discuss progress, challenges, and next steps. 4. Lab Work/Field Work: Engage in experimental work, simulations, or field studies as required by the research project. 5. Data Collection and Analysis: Collect, analyze, and interpret data using appropriate tools and techniques. 6. Documentation: Maintain detailed records of research activities, experiments, and findings.			
Deliverables			
1. Weekly Reports: Submit weekly progress reports to academic and research mentors. 2. Monthly Reports: Submit monthly progress reports to academic and research mentors. 3. Mid-Term Review: Participate in a mid-term review meeting to assess progress and realign research goals if necessary. 4. Report and Research Paper: Prepare a draft report and a research paper detailing the research problem, methodology, results and discussions, and conclusions. 5. Presentation: Deliver a presentation summarizing the research work to faculty, peers, and other stakeholders upon completion of the internship.			

Assessment Criteria	
1. Research Quality: Evaluate the quality and rigor of the research conducted. 2. Report Quality: Assess the clarity, organization, and thoroughness of the report and the research paper. 3. Presentation: Evaluate the effectiveness and clarity of the final presentation. 4. Innovation and Creativity: Consider the originality and innovative aspects of the research. 5. Self-Reflection: Review the student's ability to critically reflect on their research experience and identify areas for future growth.	
Post-Internship	
1. Feedback Session: Attend a feedback session with academic mentors to discuss the research experience and areas of improvement. 2. Publication: Explore opportunities to publish the research findings in academic journals or conferences. 3. Networking: Maintain professional relationships established during the internship for future research collaborations.	
Additional Tips	
• Curiosity: Cultivate a curious mindset and a willingness to explore new ideas. • Collaboration: Work collaboratively with other researchers and team members. • Adaptability: Be open to modifying research approaches based on findings and feedback. • Communication: Develop strong written and oral communication skills to effectively present research findings. • Time Management: Prioritize tasks and manage time efficiently to meet research deadlines.	

Evaluation Scheme	
Continuous Internal Evaluation (CIE): I (Only OFFLINE)	Will be conducted during the 7 th semester BE. Students shall submit the Research Internship Proposal and make a presentation and answer questions raised by the Departmental Internship Evaluation Committee (DIEC). Marks split-up: Research Internship Proposal – 50 marks + Oral Presentation-25 marks + Question and Answer-25 marks.
Continuous Internal Evaluation (CIE): II (ONLINE/OFFLINE)	Will be conducted during the middle of the 8 th semester BE. Students shall submit the Reports (daily/weekly/monthly reports), make a presentation on progress done so far and answer questions raised by the Departmental Internship Evaluation Committee. Marks split-up: Reports – 50 marks + Oral Presentation-25 marks + Question and Answer-25 marks.
Continuous Internal Evaluation (CIE): III (Only OFFLINE)	Will be conducted at the end of the 8 th semester BE. Students shall submit the Reports (daily/weekly/monthly reports) and the final internship report, make a presentation on work completed and answer questions raised by the Departmental Internship Evaluation Committee. Marks split-up: Reports – 50 marks + Oral Presentation-25 marks + Question and Answer-25 marks.
CIE Marks (Max 100)	Average of the CIE:I , CIE-II and CIE:III marks
Semester-End-Examinations (SEE) (Only OFFLINE)	Will be conducted within a week of the last working day of the 8 th semester BE. Student shall submit the internship report approved by all the concerned, make a presentation and answer the questions raised by the internal and external examiners. Marks split-up: Reports – 50 marks + Oral Presentation-25 marks + Question and Answer-25 marks.

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

22CBS83.1	Apply appropriate research methodologies and tools to design and conduct experiments, analyze data, and draw conclusions.
22CBS83.2	Demonstrate the ability to identify and solve complex engineering problems through innovative and systematic research approaches.
22CBS83.3	Acquire proficiency in using advanced technologies, tools, and techniques relevant to their field of research.
22CBS83.4	Develop skills in writing comprehensive research reports, documentation, and effectively presenting research findings.
22CBS83.5	Understand and apply ethical standards in research, including plagiarism avoidance, proper citations, and data integrity.
22CBS83.6	Gain experience in working collaboratively within a research team and contributing effectively to the shared goals of the project.

References

- 1. AICTE Internship Policy : Guidelines and Procedures 2019.**
Available at <https://aicte-india.org/sites/default/files/AICTE%20Internship%20Policy.pdf>
- 2. UGC Guidelines for Internship/Research Internship for Under Graduate Students 2023.**
Available at https://www.ugc.gov.in/pdfnews/0063650_Draft-Guidelines-for-Internship-and-Research-Internship-for-Under-Graduate-Students.pdf
- 3. VTU Mandatory Internship Guidelines 2021.**
Available at <https://vtu.ac.in/pdf/regulations2021/anex4.pdf>

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
22CBS83.1	1	-	2	3	-	-	-	-	-	-	-	-	-
22CBS83.2	3	2	-	-	-	-	-	-	-	-	-	-	-
22CBS83.3	-	-	-	-	3	2	-	-	-	-	1	-	-
22CBS83.4	-	-	-	-	-	-	-	-	-	3	1	-	-
22CBS83.5	-	-	-	-	-	2	-	3	-	-	1	-	-
22CBS83.6	-	-	-	-	-	-	-	-	3	2	1	-	-

1: Low 2: Medium 3: High

Research/Industry Internship			
Course Code	22CBS83	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Practical	SEE Marks	50
		Total Marks	100
Number of Weeks	14-16 Weeks	SEE	3 Hours
		Credits	10
Industry Internship			
Course Learning Objectives:			
1. To develop practical engineering skills through hands-on experience in a real-world industrial environment. 2. To enhance the ability to identify, analyze, and solve complex engineering problems encountered during the internship. 3. To gain an understanding of the functioning of the industry, including exposure to its standards, practices, and emerging technologies. 4. To improve communication, collaboration, and teamwork skills by working with professionals in a multidisciplinary team setting. 5. To foster adaptability by learning to work in dynamic and fast-paced industrial environments while embracing lifelong learning. 6. To instill a sense of professional ethics, responsibility, and accountability in engineering practice by adhering to industry-specific codes of conduct.			
Pre-Internship Preparation			
1. Orientation Session: Attend an orientation session with the academic mentor (allotted from the Department) to understand the internship goals, expectations, and assessment criteria. 2. Documentation: Complete necessary documentation, including the approval from the Department, processing of the internship request application, internship agreements if applicable etc. 3. Goal Setting: Define specific, measurable, achievable, relevant, and time-bound (SMART) goals in consultation with academic and industry mentors.			
During the Internship			
1. Work Plan: Follow a structured work plan provided by the host organization. 2. Mentorship: Regularly meet with assigned industry and academic mentors to review progress and seek guidance. 3. Work Diary/Daily Report/Learning Diary: Maintain a diary/logbook documenting daily activities, learnings, challenges, and reflections. 4. Professional Conduct: Adhere to the professional and ethical standards of the host organization, including dress code, punctuality, and communication protocols. 5. Skill Application: Actively participate in projects and tasks assigned, applying theoretical knowledge to practical situations.			
Deliverables			
1. Weekly Reports: Submit the weekly progress reports to academic and industry mentors. 2. Monthly Reports: Submit the monthly progress reports to academic and industry mentors. 3. Mid-Term Review/Evaluation: Participate in a mid-term review meeting/evaluation to assess progress and realign goals if necessary. 4. Final Report: Prepare a comprehensive final report in the specified format detailing the projects undertaken, skills acquired, challenges faced, and overall learning experience. 5. Presentation: Deliver a presentation summarizing the internship experience to faculty evaluators and peers upon completion of the internship.			
Assessment Criteria			
1. Performance Evaluation: Receive feedback from the industry mentor based on work performance, technical skills, and professional behaviour.			

2. Report Quality: Evaluate the quality, clarity, and comprehensiveness of the final report. 3. Presentation: Assess the effectiveness and clarity of the final presentation. 4. Self-Reflection: Review the student's ability to critically reflect on their learning experience and identify areas for future growth.
Post-Internship
1. Feedback Session: Attend a feedback session with academic mentors to discuss the internship experience and areas of improvement. 2. Certification: Obtain an internship completion certificate from the host organization. 3. Networking: Maintain professional relationships established during the internship for future opportunities.
Additional Tips
• Professionalism: Demonstrate a professional attitude and work ethic at all times. • Adaptability: Be open to learning and adapting to new environments and technologies. • Communication: Develop strong communication skills to effectively collaborate with colleagues and mentors. • Time Management: Prioritize tasks and manage time efficiently to meet deadlines.

Evaluation Scheme	
Continuous Internal Evaluation (CIE): I (ONLINE/OFFLINE)	Will be conducted during the middle of the 8 th semester BE. Students shall submit the Reports (daily/weekly/monthly reports), make a presentation on work done so far and answer questions raised by the Departmental Internship Evaluation Committee. Marks split-up: Reports – 50 marks + Oral Presentation 25 marks + Question and Answer 25 marks.
Continuous Internal Evaluation (CIE): II (Only OFFLINE)	Will be conducted at the end of the 8 th semester BE. Students shall submit the Reports (daily/weekly/monthly reports) and the final report, make a presentation on work completed and answer questions raised by the Departmental Internship Evaluation Committee. Marks split-up: Reports – 50 marks + Oral Presentation 25 marks + Question and Answer 25 marks.
CIE Marks (Max 100)	Average of the CIE:I and CIE:II marks
Semester-End-Examinations (SEE) (Only OFFLINE)	Will be conducted within a week of the last working day of the 8 th semester BE. Student shall submit the internship report approved by all the concerned, make a presentation and answer the questions raised by the internal and external examiners. Marks split-up: Reports – 50 marks + Oral Presentation 25 marks + Question and Answer 25 marks.

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

22CBS83.1	Apply engineering concepts and theoretical knowledge to solve real-world industry problems.
22CBS83.2	Enhance their problem-solving abilities by identifying, analyzing, and providing innovative solutions to engineering challenges in the industry.
22CBS83.3	Develop key professional skills such as teamwork, communication, and time management in a corporate or industrial environment.
22CBS83.4	Gain exposure to industry-standard tools, technologies, methodologies, and regulatory standards relevant to their field of study.
22CBS83.5	Demonstrate understanding and adherence to professional ethics, safety regulations, and responsibilities in an industrial setting.
22CBS83.6	Build a network of industry professionals and gain insights into career opportunities, preparing them for future employment in the engineering sector.

References**1. AICTE Internship Policy : Guidelines and Procedures 2019.**Available at <https://aicte-india.org/sites/default/files/AICTE%20Internship%20Policy.pdf>**2. UGC Guidelines for Internship/Research Internship for Under Graduate Students 2023.**Available at https://www.ugc.gov.in/pdfnews/0063650_Draft-Guidelines-for-Internship-and-Research-Internship-for-Under-Graduate-Students.pdf**3. VTU Mandatory Internship Guidelines 2021.**Available at <https://vtu.ac.in/pdf/regulations2021/anex4.pdf>**Course Articulation Matrix**

Course Outcomes (COs)	Program Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
22CBS83.1	3	2	-	-	-	1	-	-	-	-	1	-	-
22CBS83.2	-	3	2	1	-	-	-	-	-	-	1	-	-
22CBS83.3	-	-	-	-	-	-	-	-	3	2	-	-	-
22CBS83.4	-	-	-	-	3	2	-	-	-	-	1	-	-
22CBS83.5	-	-	-	-	-	2	-	3	-	-	-	-	-
22CBS83.6	-	-	-	-	-	-	-	-	2	3	1	-	-

1: Low 2: Medium 3: High

Core Values of the Institution

SERVICE

A Josephite will keep service as the prime goal in everything that is undertaken. Meeting the needs of the stakeholders will be the prime focus of all our endeavors.

EXCELLENCE

A Josephite will not only endeavor to serve, but serve with excellence. Preparing rigorously to excel in whatever we do will be our hallmark.

ACCOUNTABILITY

Every member of the SJEC Family will be guided to deliver on assurances given within the constraints set. A Josephite will always keep budgets and deadlines in mind when delivering a service.

CONTINUOUS ADAPTATION

Every member of the SJEC Family will strive to provide reliable and continuous service by adapting to the changing environment.

COLLABORATION

A Josephite will always seek to collaborate with others and be a team-player in the service of the stakeholders.

Objectives

- Provide Quality Technical Education facilities to every student admitted to the College and facilitate the development of all round personality of the students.
- Provide most competent staff and excellent support facilities like laboratory, library and internet required for good education on a continuous basis.
- Encourage organizing and participation of staff and students in in-house and outside Training programmes, seminars, conferences and workshops on continuous basis.
- Provide incentives and encouragement to motivate staff and students to actively involve in research-innovative projects in collaboration with industry and R & D centres on continuous basis
- Invite more and more number of persons from industry from India and abroad for collaboration and promote Industry-Institute Partnership.
- Encourage consultancy and testing and respond to the needs of the immediate neighbourhood.



St Joseph Engineering College

AN AUTONOMOUS INSTITUTION

Affiliated to VTU, Belagavi | Recognised by AICTE, New Delhi

Accredited by NAAC with A+ Grade

B.E. (CSE, ECE, EEE, ME, CIV), MBA & MCA Accredited by NBA, New Delhi

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