PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES OF ALL DEPARTMENTS– 2023-24

(CRITERIA- 2)

Department of Computer Science and Engineering (IOT, Cyber Security including Block chain Technology)

2.6.1 Program outcomes, program specific outcomes and course outcomes

Program Outcomes:

Program Outcomes (POs)
At the end of the B.E program, students are expected to have developed the following outcomes.
PO1: Apply the engineering knowledge of mathematics, science, engineering fundamentals with engineering specialization to the solution of complex engineering problems.
PO2: Identify, formulate, analyse and give solutions to complex engineering problems by reaching to substantiated conclusion using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: Use practical-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6: 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.
PO7: Understand the impact of the IoT enabled devices and the power of their and interaction leading to automation, in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO11: 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.
PO12: 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 (PSOs):	
Engineering Graduates will be able to:	
PSO-1:	Graduates will be able to design and implement IoT systems that integrate various sensors, actuators, and communication networks to solve real-world problems.
PSO-2:	Graduates will be proficient in implementing cybersecurity measures to protect data integrity and privacy in IoT and blockchain systems..
PSO-3:	Graduates will demonstrate the ability to work collaboratively in interdisciplinary teams to develop comprehensive IoT and cybersecurity solutions.

Course outcomes (COs)		
Year / SEM: 2nd year / 3rd sem		**Year of Study : 2023-24**
Course Name:– Mathematics for Computer Science- BCS301		
CO1	Explain the basic concepts of probability, random variables, probability distribution	
CO2	Apply suitable probability distribution models for the given scenario.	
CO3	Apply the notion of a discrete-time Markov chain and n-step transition probabilities to solve the given problem	
CO4	Use statistical methodology and tools in the engineering problem-solving process	
CO5	Compute the confidence intervals for the mean of the population and Apply the ANOVA test related to engineering problems.	
Year / SEM: 2ndyear / 3rdsem		**Year of Study : 2023-24**
Course Name:– Digital Design & Computer Organization- BCS302		
CO1	Apply the K–Map techniques to simplify various Boolean expressions.	
CO2	Design different types of combinational and sequential circuits along with Verilog programs.	
CO3	Describe the fundamentals of machine instructions, addressing modes and Processor performance.	
CO4	Explain the approaches involved in achieving communication between processor and I/O devices	
CO5	Analyze internal Organization of Memory and Impact of cache/Pipelining on Processor Performance	
Year / SEM: 2ndyear / 3rdsem		**Year of Study : 2023-24**
Course Name:– Operating Systems-BCS303		
CO1	Explain the structure and functionality of operating system	

CO2	Apply appropriate CPU scheduling algorithms for the given problem.
CO3	Analyse the various techniques for process synchronization and deadlock handling
CO4	Apply the various techniques for memory management and explain secondary storage management strategies.
Year / SEM: 2ndyear / 3rdsem	**Year of Study : 2023-24**
Course Name:– Data Structures And Applications- BCS304	
CO1	Explain different data structures and their applications
CO2	Apply Arrays, Stacks and Queue data structures to solve the given problems
CO3	Use the concept of linked list in problem solving.
CO4	Develop solutions using trees and graphs to model the real-world problem.
CO5	Explain the advanced Data Structures concepts such as Hashing Techniques and Optimal Binary Search Trees
Year / SEM: 2ndyear / 3rdsem	**Year of Study : 2023-24**
Course Name:– Data Structures And Applications Lab- BCSL305	
CO1	The student should be able to Analyze various linear and non-linear data structures
CO2	Demonstrate the working nature of different types of data structures and their applications
CO3	Use appropriate searching and sorting algorithms for the give scenario.
CO4	Apply the appropriate data structure for solving real world problems
Year / SEM: 2ndyear / 3rdsem	**Year of Study : 2023-24**
Course Name:– Social Connect And Responsibility -BSCK307	
CO1	Communicate and connect to the surrounding.
CO2	Create a responsible connection with the society.
CO3	Involve in the community in general in which they work
CO4	Notice the needs and problems of the community and involve them in problem –solving.
CO5	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems mobilizing community participation to acquire leadership qualities , democratic, attitudes and competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation
Year / SEM: 2ndyear / 3rdsem	**Year of Study : 2023-24**
Course Name:– Object Oriented Programming With Java- BCS306A	
CO1	Demonstrate proficiency in writing simple programs involving branching and looping structures.
CO2	Design a class involving data members and methods for the given scenario.
CO3	Apply the concepts of inheritance and interfaces in solving real world problems.
CO4	Use the concept of packages and exception handling in solving complex problem
CO5	Apply concepts of multithreading, auto boxing and enumerations in program development
Year / SEM: 2ndyear / 3rdsem	**Year of Study : 2023-24**
Course Name:– Data Visualization With Python- BCS358D	
CO1	Demonstrate the use of IDLE or PyCharm IDE to create Python Applications
CO2	Use Python programming constructs to develop programs for solving real-world problems
CO3	Use Matplotlib for drawing different Plots
CO4	Demonstrate working with Seaborn, Bokeh for visualization.
CO5	Use Plotly for drawing Time Series and Map

Year / SEM: 2ndyear / 4th sem	Year of Study : 2023-24
Course Name:– Elements of Cyber Security and IoT-BIC401	
CO1	Understand the various types of cyber threats and attacks.
CO2	Explain various attacks and security aspects in Digital payment
CO3	Understand the various concepts in Email and web Security.
CO4	Describe fundamentals of IoT and its challenges.
CO5	Analyse different access technologies for IoT.
Year / SEM: 2ndyear / 4th sem	**Year of Study : 2023-24**
Course Name:– Analysis & Design of Algorithms - BCO402	
CO1	Apply asymptotic notational method to analyze the performance of the algorithms in terms of time complexity.
CO2	Demonstrate divide & conquer approaches and decrease & conquer approaches to solve computational problems using suitable tools.
CO3	Make use of transform & conquer and dynamic programming design approaches to solve the given real world or complex computational problems.
CO4	Apply greedy and input enhancement methods to solve graph & string based computational problems using suitable tools.
CO5	Analyse various classes (P,NP and NP Complete) of problems and Illustrate backtracking, branch & bound and approximation methods.
Year / SEM: 2ndyear / 4th sem	**Year of Study : 2023-24**
Course Name:– Database Management System- BCS403	
CO1	Describe the basic elements of a relational database management system
CO2	Design entity relationship for the given scenario..
CO3	Apply various Structured Query Language (SQL) statements for database manipulation.
CO4	Analyse various normalization forms for the given application
CO5	Develop database applications for the given real world problem and Understand the concepts related to NoSQL databases
Year / SEM: 2ndyear / 4th sem	**Year of Study : 2023-24**
Course Name:– Cyber Security lab- BICL 404	
CO1	Demonstrate the usage of tools to identify cyber threats/attacks
CO2	Use Autopsy tools for digital forensic.
CO3	Demonstrate Network analysis using Network miner tools.
Year / SEM: 2ndyear / 4th sem	**Year of Study : 2023-24**
Course Name:– Discrete Mathematical Structures-BCS405A	
CO1	Apply concepts of logical reasoning and mathematical proof techniques in proving theorems and statements.
CO2	Demonstrate the application of discrete structures in different fields of computer science.
CO3	Apply the basic concepts of relations, functions and partially ordered sets for computer representations.
CO4	Solve problems involving recurrence relations and generating functions
CO5	Illustrate the fundamental principles of Algebraic structures with the problems related to computer science & engineering.
Year / SEM: 2ndyear / 4th sem	**Year of Study : 2023-24**
Course Name:– Embedded C -BICL456B	
CO1	Develop and test program using ARM7TDMI/LPC2148
CO2	Conduct the following experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler..
Year / SEM: 2ndyear / 4th sem	**Year of Study : 2023-24**

Course Name:– Biology for Engineers- BBOK407	
CO1	Elucidate the basic biological concepts via relevant industrial applications and case study
CO2	Evaluate the principles of design and development, for exploring novel bioengineering projects
CO3	Corroborate the concepts of biomimetic for specific requirements.
CO4	Think critically towards exploring innovative bio based solutions for socially relevant problems.
Year / SEM: 2ndyear / 4th sem	**Year of Study : 2023-24**
Course Name:– Universal Human Value Course- BUHK408	
CO1	They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
CO2	They would have better critical ability.
CO3	They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
CO4	It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this

PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES OF ALL DEPARTMENTS– 2023-24

(CRITERIA- 2)

Department of Computer Applications

2.6.1 Program outcomes, program specific outcomes and course outcomes

Program Outcomes:

Program outcome(PO)

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	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.
PO3	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
PO4	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.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering

	and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	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
PO7	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.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	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.
PO11	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.
PO12	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(PSOs)	
MCA Graduates will be able to:	
PSO-1	Understand the principles of Computer Applications and enrich knowledge in recent advancements and developments in Software Industries.
PSO-2	Competent in programming and computing skills, ability to apply software development methodologies and modelling to solve real world problems.

Course Outcomes(COs)

	Year/Sem:1st Year/1st Sem	Year of Study:2023-2024
	Course Name: **Mathematical Foundation for Computer Applications**	
CO1	Apply the fundamentals of set theory and matrices for the given problem.	
CO2	Apply the types of distribution, evaluate the mean and variance for the given case study/ problem.	
CO3	Solve the given problem by applying the Mathematical logic concepts.	
CO4	Model the given problem by applying the concepts of graph theory.	
CO5	Design strategy using gaming theory concepts for the given problem.	
CO6	Identify and list the different applications of discrete mathematical concepts in computer science	

	Year/Sem:1st Year/1st Sem	Year of Study:2023-2024
	Course Name: **Operating System Concepts**	
CO1	Analyse the basic Operating System Structure and concept of Process Management	
CO2	Analyse the given Synchronization/ Deadlock problem to solve and arrive at valid conclusions.	
CO3	Solve the given problem by applying the Mathematical logic concepts.	
CO4	Ability to design and solve synchronization problems.	
CO5	Ability to simulate and implement operating system concepts such as scheduling, Deadlock management, file management, and memory management.	

	Year/Sem:1st Year/1st Sem	Year of Study:2023-2024
	Course Name: **Data Structures**	
CO1	Demonstrate different data structures, its operations using C programming the	

CO2	Apply control structures the concepts of inheritance and overloading for a given problem.
CO3	Perform essential operations using Numpy and Pandas
CO4	Structuring data in the dataset for a given problem
CO5	Demonstrate the concepts of data visualization.

	Year/Sem:1st Year/1st Sem	Year of Study:2023-2024
	Course Name: **Computer Networks**	
CO1	Apply the basic concepts of networks like protocol, internet and OSI layers	
CO2	Analyze the Physical Layer of 1 and 2	
CO3	Demonstrate the various Switching networks	
CO4	Analyze the Data Link Layer of 1 and 2	

	Year/Sem:1st Year/1st Sem	Year of Study:2023-2024
	Course Name: **Design and Analysis of Algorithms**	
CO1	Describe the basic algorithm design strategies and use them for devising new solutions to various problems	
CO2	Analyse algorithms for time/space complexity	
CO3	Differentiate between deterministic and probabilistic algorithms and use the probabilistic algorithms in appropriate scenarios	

	Year/Sem:1st Year/1st Sem	Year of Study:2023-2024
	Course Name: **Research Methodology and IPR**	
CO1	Identify the suitable research methods and articulate the research steps in a proper sequence for the given problem.	
CO2	Carry out literature survey, define the problem statement and suggest suitable solution for the given problem and present in the format of the research paper (IEEE).	
CO3	Analyse the problem and conduct experimental design with the samplings. L2	
CO4	Perform the data collection from various sources segregate the primary and secondary L2 Data.	
CO5	Apply some concepts/section of Copy Right Act /Patent Act /Cyber Law/ Trademark to L2	

	the given case and develop –conclusions.

	Year/Sem:1st Year/1st Sem	Year of Study:2023-2024
	Course Name: **Basics of Programming & CO**	
CO1	Demonstrate the key concepts introduced in C programming by writing and executing the programs.	
CO2	Demonstrate the concepts of structures and pointers for the given application/problem.	
CO3	Implement the single/multi-dimensional array for the given problem.	
CO4	Demonstrate the application of logic gates in solving some societal/industrial problems.	
CO5	Analyse how memory organization, operations, instruction sequencing and interrupts are useful in executing the given program.	

	Year/Sem:1st Year/2nd Sem	Year of Study:2023-2024
	Course Name: **Database Management System**	
CO1	Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS	
CO2	Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of query evaluation.	
CO3	Design and build simple database systems and relate the concept of transaction, concurrency control and recovery in database	
CO4	Develop application to interact with databases, relational algebra expression.	
CO5	Develop applications using tuple and domain relation expression from queries.	

	Year/Sem:1st Year/2nd Sem	Year of Study:2023-2024
	Course Name: **Object Oriented Programming Using Java**	
CO1	Use object oriented programming concepts to solve real world problems.	
CO2	Explain the concept of class and objects with access control to represent real world entities	
CO3	Describe the concept of interface and abstract classes to define generic classes.	
CO4	Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by	

	using extend and implement keywords.
CO5	Demonstrate the user defined exceptions by exception handling keywords (try, catch, throw, throws and finally)
CO6	Understand the process of graphical user interface design and implementation using AWT or swings.
CO7	CO7 Use different layouts (Flow Layout, Boarder Layout, Grid Layout, Card Layout) to position the controls for developing graphical user interface

	Year/Sem:1st Year/2nd Sem	Year of Study:2023-2024
	Course Name: **Software Engineering**	
CO1	Design a software system, component or process to meet desired needs within realistic constraints	
CO2	Assess professional and ethical responsibility	
CO3	Function on multi-disciplinary teams	
CO4	Use the techniques, skills, and modern engineering tools necessary for engineering practice	
CO5	Analyze, design, implement, verify, validate, implement, apply, and maintain software systems or parts of software systems	

	Year/Sem:1st Year/2nd Sem	Year of Study:2023-2024
	Course Name: **Web Technologies**	
CO1	Apply the features JQuery for the given web based problem	
CO2	Demonstrate the development of XHTML documents using JavaScript and CSS.	
CO3	Illustrate the use of CGI and Perl programs for different types of server side applications.	
CO4	Design and implement user interactive dynamic web based applications.	
CO5	Demonstrate applications of Angular JS and JQuery for the given problem.	
CO6	Apply the concept and usages web based programming techniques.	
CO7	CO7 Learning and Developing XHTML documents using JavaScript and CSS.	

	Year/Sem:1st Year/2nd Sem	Year of Study:2023-2024

	Course Name: **Computer Graphics with Open GL**
CO1	Design and implement algorithms for 2D graphics primitives and attributes.
CO2	Illustrate Geometric transformations on both 2D and 3D objects.
CO3	Understand the concepts of clipping and visible surface detection in 2D and 3D viewing and Illumination Models.
CO4	Discuss about suitable hardware and software for developing graphics packages using OpenGL

	Year/Sem:1st Year/2nd Sem	Year of Study:2023-2024
	Course Name: **Data Mining and Business Intelligence**	
CO1	Analyse the concept of data warehouse, Business Intelligence and OLAP.	
CO2	Demonstrate data pre-processing techniques and application of association rule mining Algorithms.	
CO3	Apply various classification algorithms and evaluation of classifiers for the given Problem.	
CO4	Analyse data mining for various business intelligence applications for the given problem.	
CO5	Apply classification and regression techniques for the given problem.	

	Year/Sem:1st Year/2nd Sem	Year of Study:2023-2024
	Course Name: **Enterprise Resource Planning**	
CO1	Analyse the essentials of supply chain management in ERP.	
CO2	Analyse the implementation of ERP in the context of business of the different organization	
CO3	Analyse and apply ERP for different business modules for the given problem.	
CO4	Analyse the given case study of ERP marketing.	
CO5	Analyse the design of ERP with future E-commerce and internet.	

	Year/Sem:1st Year/2nd Sem	Year of Study:2023-2024
	Course Name: **User Interface Design**	
CO1	Analyse the new technologies that provide interactive devices and interfaces.	
CO2	Apply the guidelines to develop the UID and evaluate for the given problem.	
CO3	Apply the development methodologies with an analysis of the social impact and legal issues Understand Direct Manipulation and Virtual Environment	

CO4	Discuss the command, natural languages and issues in design for maintaining QoS
CO5	Demonstrate techniques for information search and visualization for the given problem.

	Year/Sem:1st Year/2nd Sem	Year of Study:2023-2024
	Course Name: **Optimization Techniques**	
CO1	Recall the theoretical foundations of various issues related to linear programming modeling to formulate real-world problems as a L P model	
CO2	Explain the theoretical workings of the graphical, simplex and analytical methods for making effective decision on variables so as to optimize the objective function.	
CO3	Identify appropriate optimization method to solve complex problems involved in various industries.	
CO4	Demonstrate the optimized material distribution schedule using transportation model to minimize total distribution cost.	
CO5	Explain the theoretical workings of sequencing techniques for effective scheduling of jobs on machines.	

	Year/Sem:1st Year/2nd Sem	Year of Study:2023-2024
	Course Name: **Cryptography and Network Security**	
CO1	Analyze and design classical encryption techniques and block ciphers	
CO2	Understand and analyze data encryption standard.	
CO3	Understand and analyze public-key cryptography, RSA and other public-key cryptosystems	
CO4	Understand key management and distribution schemes and design User Authentication, such as Diffie-Hellman Key Exchange, ElGamal Cryptosystem, etc	
CO5	Analyze and design hash and MAC algorithms, and digital signatures.	

	Year/Sem:1st Year/2nd Sem	Year of Study:2023-2024
	Course Name: **Artificial Intelligence**	
CO1	Identify problems that are amenable to solution by AI methods.	
CO2	Identify appropriate AI methods to solve a given problem.	
CO3	Formalize a given problem in the language/framework of different AI methods	
CO4	Implement basic AI algorithms for the given problem.	

CO5	Design and carry out an empirical evaluation of different algorithms on a problem formalisation, and state the conclusions that the evaluation supports.

	Year/Sem:1st Year/2nd Sem	Year of Study:2023-2024
	Course Name: **Mobile Application Development**	
CO1	Describe the requirements for mobile applications	
CO2	Explain the challenges in mobile application design and development	
CO3	Develop design for mobile applications for specific requirements	
CO4	Implement the design using Android SDK, Objective C and iOS	
CO5	Deploy mobile applications in Android and iPone marketplace for distribution	

	Year/Sem:1st Year/2nd Sem	Year of Study:2023-2024
	Course Name: **Distributed Operating System**	
CO1	Analyse design issues and different message passing techniques in DOS, distributed systems	
CO2	Analyse RPC implementation and its performance in DOS	
CO3	Analyse the major security issues associated with distributed systems and evaluate techniques available for increasing system security	
CO4	Apply the concepts of distributed shared memory and resource management for the given problem/ case study.	
CO5	Analyse distributed file systems and evaluate the performance in terms of fault tolerance, file replication as major factors.	
CO6	Apply modification to the existing algorithms to improve the performance of DOS.	

	Year/Sem:1st Year/2nd Sem	Year of Study:2023-2024
	Course Name: **Natural Language Processing**	
CO1	Apply parsing technique to the given problem and verify the output and give valid conclusions.	
CO2	Illustrate the approaches to syntax and semantics in NLP.	
CO3	Formulate solutions for a range of natural language components using existing algorithms, techniques and frameworks, including part-of-speech tagging, language modelling, parsing and semantic role labelling.	

CO4	Evaluate NLP solutions of the given problem and arrive at valid conclusions.
CO5	Illustrate information retrieval techniques.

	Year/Sem:2st Year/3rd Sem	Year of Study:2023-2024
	Course Name: **Data Analytics using Python**	
CO1	Understand and comprehend the basics of Python programming.	
CO2	Apply knowledge in real time applications	
CO3	Apply the Data Pre-processing & Data Wrapping	
CO4	Demonstrate the Web Scraping and Numerical Analysis	

	Year/Sem:2st Year/3rd Sem	Year of Study:2023-2024
	Course Name: **Internet of Things**	
CO1	Analyse the IoT architecture and design along with functional/compute stack and data management.	
CO2	Apply IOT architecture for a given problem.	
CO3	Analyse the application protocol, transport layer methods for the given business case.	
CO4	Analyse the application of data analytics for IOT for a given.	
CO5	Analyse the architecture and develop programming using modern tools for the given	

	Year/Sem:2st Year/3rd Sem	Year of Study:2023-2024
	Course Name**: Block chain Technology**	
CO1	Demonstrate the basics of Block chain concepts using modern tools/technologies.	
CO2	Analyze the role of block chain applications in different domains including cyber security.	
CO3	Evaluate the usage of Block chain implementation/features for the given problem.	
CO4	Exemplify the usage of bitcoins and its impact on the economy	
CO5	Analyze the application of specific block chain architecture for a given problem.	

	Year/Sem:2st Year/3rd Sem	Year of Study:2023-2024
	Course Name: **Cloud Computing**	
CO1	Demonstrate the fundamental and core concepts of cloud computing	
CO2	Compare between parallel and distributed computing	
CO3	Investigate the system virtualization and outline its role in enabling the cloud computing system model	
CO4	Compare different deployment and service models of cloud to develop different variety of applications	

	Year/Sem:2st Year/3rd Sem	Year of Study:2023-2024
	Course Name: **Digital Marketing**	
CO1	Analyze the use of different electronic media for designing marketing activities	
CO2	Analyze the role of search engine in improving digital marketing	
CO3	Analyze role of social media marketing for the given problem	
CO4	Overcome social media threats with the analysis of technical solutions	

	Year/Sem:2st Year/3rd Sem	Year of Study:2023-2024
	Course Name: **Object Oriented Modeling and Design**	
CO1	Explain the concepts of object-oriented and basic class modelling.	
CO2	Create class diagrams, sequence diagrams and interaction diagrams to solve problems.	
CO3	Choose and apply a befitting design pattern for the given problem.	

	Year/Sem:2st Year/3rd Sem	Year of Study:2023-2024
	Course Name: **NOSQL**	
CO1	Analyse and Manage the Data using CRUD operations	
CO2	Apply and Develop the applications using NoSQL	
CO3	Realize the concept of Map Reduce its applicability in the real world application development	

CO4	Apply the framework of NOSQL to find the solutions

	Year/Sem:2st Year/3rd Sem	Year of Study:2023-2024
	Course Name: **Advanced Java and J2EE**	
CO1	Interpret the need for advanced Java concepts like enumerations and collections in developing modular and efficient programs	
CO2	Develop Solutions to problems using Arrays, Structures, Stack, Queues	
CO3	Illustrate database access and details for managing information using the JDBC API	

	Year/Sem:2st Year/3rd Sem	Year of Study:2023-2024
	Course Name: **Introduction to Dot Net Framework for Application Development**	
CO1	Build applications on Visual Studio .NET platform by understanding the syntax and semantics of C#.	
CO2	Demonstrate Object Oriented Programming concepts in C# programming language L3	
CO3	CO 3 Design custom interfaces for applications and leverage the available built-in interfaces in building complex applications.	
CO4	CO 4 Illustrate the use of generics and collections in C#	

	Year/Sem:2st Year/3rd Sem	Year of Study:2023-2024
	Course Name: **Knowledge Engineering**	
CO1	Recognize the fundamental concepts of Artificial Intelligence such as knowledge representation, problem solving, fuzzy set and expert systems	
CO2	Implement the search methods using Python	
CO3	Use the Connectionist Models for solving problems.	

	Year/Sem:2st Year/3rd Sem	Year of Study:2023-2024
	Course Name: **Software Testing**	
CO1	Acquire knowledge of basic principles and knowledge of software testing and Debugging and test cases.	
CO2	Understand the perceptions on testing like levels of testing, generalized pseudo code and with related examples	
CO3	Analyze the difference between functional testing and structural testing.	

	Year/Sem:2st Year/3rd Sem	Year of Study:2023-2024
	Course Name: **Virtual Reality**	
CO1	Build application on how VR systems work and list the applications of VR systems.	
CO2	Design and implement the hardware that enables VR systems to be built	
CO3	Explain the concepts of motion and tracking in VR systems.	
CO4	CO 4 Explore the importance of interaction and audio in VR	

	Year/Sem:2st Year/4th Sem	Year of Study:2023-2024
	Course Name: **Deep Learning**	
CO1	Illustrate the basics of deep learning for a given context	
CO2	Apply various deep learning models for the given problem	
CO3	Realign high dimensional data using reduction techniques for the given problem	
CO4	Apply and Analyze optimization and generalization techniques for the given problem	
CO5	Application of latest deep learning techniques and to enhance the results.	

	Year/Sem:2st Year/4th Sem	Year of Study:2023-2024
	Course Name: **Big Data Analytics**	
CO1	Apply analytical tools to identify and solve the business problem for a given context.	
CO2	Analyse various algorithms for handling large volumes of data.	

CO3	Apply the architecture of HDFS and explain functioning of HDFS clusters.
CO4	Apply and Analyze optimization and generalization techniques for the given problem
CO5	Analyse the usage of Map-Reduce techniques for solving big data problems.
CO6	Carryout experiments on various datasets for analysis / visualization.

	Year/Sem:2st Year/4th Sem	Year of Study:2023-2024
	Course Name: **Wireless Ad Hoc Networks**	
CO1	Analyze the issues of ad-hoc wireless network	
CO2	Evaluate the existing network and improve its quality of service	
CO3	Choose appropriate protocol for various applications and design the architecture	
CO4	Examine security measures present at different levels and identify the possible improvements for the latest version of the ad hoc network IEEE standard	
CO5	Analyze energy consumption and management in ad-hoc wireless networks	

	Year/Sem:2st Year/4th Sem	Year of Study:2023-2024
	Course Name: **Software Project Management**	
CO1	Apply theoretical concepts for projects management	
CO2	Planning for resources allocation with case studies.	
CO3	Solving problems related to risk identification, cost based analysis, etc.	
CO4	Managing and working in team	

	Year/Sem:2st Year/4th Sem	Year of Study:2023-2024
	Course Name**: Software Defined Networks**	
CO1	Apply the fundamentals of Software Defined Networks for the given problem .	
CO2	Illustrate the basics of Software Defined Networks Operations and Data flow.	
CO3	Apply different Software Defined Network Operations and Data Flow	
CO4	Analyse alternative definitions of Software Defined Networks	
CO5	Apply different Software Defined Network Operations in real world problem	

	Year/Sem:2st Year/4th Sem	Year of Study:2023-2024

	Course Name: **IT Project management**
CO1	Recognize knowledge about the basic project management concepts, framework and the process models.
CO2	Identify knowledge about software process models and software effort estimation techniques.
CO3	Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles

	Year/Sem:2st Year/4th Sem	Year of Study:2023-2024
	Course Name: **Semantic Web & Social Networks**	
CO1	Summarize to create ontology and knowledge representation for the semantic web	
CO2	Solve to build a blogs and social networks	
CO3	Describe the Modeling and aggregating social network data.	
CO4	Illustrate the Web- based social network and Ontology	

	Year/Sem:2st Year/4th Sem	Year of Study:2023-2024
	Course Name: **Fundamentals of Game Design**	
CO1	Understand basics of game design	
CO2	Build approaches and key components of video games	
CO3	Apply Game concept in designing the games	
CO4	Build visual appearances for games	

	Year/Sem:2st Year/4th Sem	Year of Study:2023-2024
	Course Name: **Agile Technologies**	
CO1	Illustrate the working of Agile Methods, XP	
CO2	Explain the concept of Coding Standards, Iteration Demo, Reporting	
CO3	Demonstrate Incremental requirements, Customer Tests, Test-Driven Development, Refactoring (can be attained through assignment or CIE)	
CO4	Evaluate how to Build Effective Relationships (can be attained through assignment or CIE)	

	Year/Sem:2st Year/4th Sem	Year of Study:2023-2024
	Course Name: **SOFTWARE METRICS & QUALITY ASSURANCE**	
CO1	Identify and apply various software metrics, which determines the quality level of software	
CO2	Compare and Pick out the right reliability model for evaluating the software	
CO3	Discover new metrics and reliability models for evaluating the quality level of the software based on the requirement	
CO4	Identify and evaluate the quality level of internal and external attributes of the software product	

PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES OF ALL DEPARTMENTS– 2023-24

(CRITERIA- 2)

Department of Artificial Intelligence and Machine Learning

2.6.1 Program outcomes, program specific outcomes and course outcomes

Program Outcomes:

Program Outcomes (POs)
At the end of the B.E program, students are expected to have developed the following outcomes.
PO1: Apply the engineering knowledge of mathematics, science, engineering fundamentals with engineering specialization to the solution of complex engineering problems.
PO2: Identify, formulate, analyse and give solutions to complex engineering problems by reaching to substantiated conclusion using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: Use practical-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6: 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.
PO7: Understand the impact of the IoT enabled devices and the power of their and interaction leading to automation, in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO11: 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.
PO12: 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 (PSOs):	
The AIML graduates will have the ability to:	
PSO-1:	Design and develop AI & ML Solution, through modern engineering tools and Programming Language, Technical skills in presenting modern insights..
PSO-2:	Ability to adapt continues changing AI & ML domain for innovative challenges.

Course outcomes (COs)	
Year / SEM: 2nd year / 3rd sem	**Year of Study : 2023-24**
Course Name:– Transform Calculus, Fourier Series And Numerical Techniques-21MAT31	
CO1	To solve ordinary differential equations using Laplace transform
CO2	Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory
CO3	To use Fourier transforms to analyze problems involving continuous-time signals and to apply ZTransform techniques to solve difference equations
CO4	To solve mathematical models represented by initial or boundary value problems involving partial differential equations
CO5	Determine the extremals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis
Year / SEM: 2ndyear / 3rdsem	**Year of Study : 2023-24**
Course Name:– Data Structures And Applications-21CS32	
CO1	Identify different data structures and their applications
CO2	Apply stack and queues in solving problems.
CO3	Demonstrate applications of linked list.
CO4	Explore the applications of trees and graphs to model and solve the real-world problem
CO5	Make use of Hashing techniques and resolve collisions during mapping of key value pairs
Year / SEM: 2ndyear / 3rdsem	**Year of Study : 2023-24**
Course Name:– Analog And Digital Electronics-21CS33	
CO1	Design and analyze application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp.
CO2	Explain the basic principles of A/D and D/A conversion circuits and develop the same
CO3	Simplify digital circuits using Karnaugh Map, and Quine-McClusky Methods.
CO4	Explain Gates and flip flops and make us in designing different data processing circuits, registers and counters and compare the types.

C05	Develop simple HDL programs
Year / SEM: 2ndyear / 3rdsem	**Year of Study : 2023-24**
Course Name:– Computer Organization And Architecture-21CS34	
CO1	Explain different data structures and their applications
CO2	Apply Arrays, Stacks and Queue data structures to solve the given problems
CO3	Use the concept of linked list in problem solving.
CO4	Develop solutions using trees and graphs to model the real-world problem.
CO5	Explain the advanced Data Structures concepts such as Hashing Techniques and Optimal Binary Search Trees
Year / SEM: 2ndyear / 3rdsem	**Year of Study : 2023-24**
Course Name:– Object Oriented Programming With Java Laboratory- 21CSL35	
CO1	Use Eclipse/NetBeans IDE to design, develop, debug Java Projects
CO2	Analyze the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP
CO3	Demonstrate the ability to design and develop java programs, analyze, and interpret object oriented data and document results
CO4	Apply the concepts of multiprogramming, exception/event handling, abstraction to develop robust programs
C05	Develop user friendly applications using File I/O and GUI concepts.
Year / SEM: 2ndyear / 3rdsem	**Year of Study : 2023-24**
Course Name:– Mastering Office (Practical Based)- 21CSL381	
CO1	Know the basics of computers and prepare documents, spreadsheets, make small presentations with audio, video and graphs and would be acquainted with internet
CO2	Create, edit, save and print documents with list tables, header, footer, graphic, spellchecker, mail merge and grammar checker
CO3	Attain the knowledge about spreadsheet with formula, macros spell checker etc
CO4	Demonstrate the ability to apply application software in an office environment
CO5	Use Google Suite for office data management tasks
Year / SEM: 2ndyear / 3rdsem	**Year of Study : 2023-24**
Course Name:– Programming In C++- 21CS382	
CO1	Able to understand and design the solution to a problem using object-oriented programming concepts.
CO2	Able to reuse the code with extensible Class types, User-defined operators and function Overloading
CO3	Achieve code reusability and extensibility by means of Inheritance and Polymorphism
CO4	Identify and explore the Performance analysis of I/O Streams.
CO5	Implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems.
Year / SEM: 2ndyear / 4thsem	**Year of Study : 2023-24**
Course Name:– Design And Analysis Of Algorithms-21CS42	
CO1	Analyze the performance of the algorithms, state the efficiency using asymptotic notations and analyze mathematically the complexity of the algorithm.
CO2	Apply divide and conquer approaches and decrease and conquer approaches in solving the problems analyze the same
CO3	Apply the appropriate algorithmic design technique like greedy method, transform and conquer approaches and compare the efficiency of algorithms to solve the given problem
CO4	Apply and analyze dynamic programming approaches to solve some problems. and improve an algorithm time efficiency by sacrificing space

CO5	Apply and analyze backtracking, branch and bound methods and to describe P, NP and NPComplete problem

Year / SEM: 2ndyear / 4th sem	**Year of Study : 2023-24**
Course Name:– Microcontroller And Embedded Systems-21CS43	
CO1	Explain C-Compilers and optimization
CO2	Describe the ARM microcontroller's architectural features and program module
CO3	Apply the knowledge gained from programming on ARM to different applications
CO4	Program the basic hardware components and their application selection method.
CO5	Demonstrate the need for a real-time operating system for embedded system applications.
Year / SEM: 2ndyear / 4th sem	**Year of Study : 2023-24**
Course Name:– Operating Systems-21CS44	
CO1	Identify the structure of an operating system and its scheduling mechanism.
CO2	Demonstrate the allocation of resources for a process using scheduling algorithm.
CO3	. Identify root causes of deadlock and provide the solution for deadlock elimination
CO4	Explore about the storage structures and learn about the Linux Operating system
CO5	Analyze Storage Structures and Implement Customized Case study
Year / SEM: 2ndyear / 4th sem	**Year of Study : 2023-24**
Course Name:– Python Programming Laboratory-21CSL46	
CO1	Demonstrate proficiency in handling of loops and creation of functions
CO2	Identify the methods to create and manipulate lists, tuples and dictionaries
CO3	Discover the commonly used operations involving regular expressions and file system
CO4	Interpret the concepts of Object-Oriented Programming as used in Python
CO5	Determine the need for scraping websites and working with PDF, JSON and other file formats.
Year / SEM: 2ndyear / 4th sem	**Year of Study : 2023-24**
Course Name:– Web Programming (Practical Based)- 21CSL481	
CO1	Describe the fundamentals of web and concept of HTML
CO2	Use the concepts of HTML, XHTML to construct the web pages
CO3	Interpret CSS for dynamic documents.
C04	Evaluate different concepts of JavaScript & Construct dynamic documents
C05	Design a small project with JavaScript and XHTML.
Year / SEM: 2ndyear / 4th sem	**Year of Study : 2023-24**
Course Name:– Unix Shell Programming-21CS482	
CO1	Know the basics of Unix concepts and commands
CO2	Evaluate the UNIX file system.
CO3	Apply Changes in file system
CO4	Understand scripts and programs
CO5	Analyze Facility with UNIX system process
Year / SEM: 2ndyear / 4th sem	**Year of Study : 2023-24**
Course Name:– R PROGRAMMING (Practical Based)- 21CSL483	
CO1	To understand the fundamental syntax of R through readings, practice exercises

CO2	To demonstrations, and writing R code.
CO3	To apply critical programming language concepts such as data types, iteration,
CO4	To understand control structures, functions, and Boolean operators by writing R programs and through examples
CO5	To import a variety of data formats into R using R-Studio
CO6	To prepare or tidy data for in preparation for analyze.

Year / SEM: 3rdyear / 5thsem	Year of Study : 2023-24
Course Name:– Automata Theory And Compiler Design-21CS51	
CO1	Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation
CO2	Design and develop lexical analyzers, parsers and code generators
CO3	Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers.
CO4	Acquire fundamental understanding of the structure of a Compiler and Apply concepts automata theory and Theory of Computation to design Compilers
CO5	Design computations models for problems in Automata theory and adaptation of such model in the field of compilers
Year / SEM: 3rdyear / 5thsem	**Year of Study : 2023-24**
Course Name:– Computer Networks-21CS52	
CO1	Learn the basic needs of communication system.
CO2	Interpret the communication challenges and its solution.
CO3	Identify and organize the communication system network components
CO4	Design communication networks for user requirements.
Year / SEM: 3rdyear / 5thsem	**Year of Study : 2023-24**
Course Name:– Database Management Systems-21CS53	
CO1	Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS
CO2	Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of query evaluation.
CO3	Design and build simple database systems and relate the concept of transaction, concurrency control and recovery in database
CO4	Develop application to interact with databases, relational algebra expression
CO5	Develop applications using tuple and domain relation expression from queries.
Year / SEM: 3rdyear / 5thsem	**Year of Study : 2023-24**
Course Name:– Principles Of Artificial Intelligence-21AI54	
CO1	Apply knowledge of agent architecture, searching and reasoning techniques for different applications
CO2	Analyse Searching and Inferencing Techniques
CO3	Develop knowledge base sentences using propositional logic and first order logic
CO4	Demonstrating agents, searching and inferencing
CO5	Illustrate the application of probability in uncertain reasoning
Year / SEM: 3rdyear / 5thsem	**Year of Study : 2023-24**
Course Name:– Database Management Systems Laboratory With Mini Project-21CSL55	
CO1	Create, Update and query on the database
CO2	Demonstrate the working of different concepts of DBM
CO3	Implement, analyze and evaluate the project developed for an application

Year / SEM: 3rdyear / 5thsem	Year of Study : 2023-24
Course Name:– Angular Js And Node Js (Practical Based)- 21CSL581	
CO1	Describe the features of Angular JS.
CO2	Recognize the form validations and controls.
CO3	Implement Directives and Controllers.
CO4	Evaluate and create database for simple application
CO5	Plan and build webservers with node using Node .JS.
Year / SEM: 3rdyear / 5thsem	**Year of Study : 2023-24**
Course Name:– C# And .Net Framework-21CS582	
CO1	Able to explain how C# fits into the .NET platform
CO2	Describe the utilization of variables and constants of C#
CO3	Use the implementation of object-oriented aspects in applications
CO4	Analyze and Set up Environment of .NET Core.
CO5	Evaluate and create a simple project application
Year / SEM: 3rdyear / 6thsem	**Year of Study : 2023-24**
Course Name:– Software Engineering & Project Management-21CS61	
CO1	Understand the activities involved in software engineering and analyze the role of various process models
CO2	Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques
CO3	Describe various software testing methods and to understand the importance of agile methodology and DevOps
CO4	Illustrate the role of project planning and quality management in software development
CO5	Understand the importance of activity planning and different planning models

Year / SEM: 3rdyear / 6th sem	Year of Study : 2023-24
Course Name:– Data Science And Its Applications-21AD62	
CO1	Identify and demonstrate data using visualization tools
CO2	Make use of Statistical hypothesis tests to choose the properties of data, curate and manipulate data.
CO3	Utilize the skills of machine learning algorithms and techniques and develop models
CO4	Demonstrate the construction of decision tree and data partition using clustering
CO5	Experiment with social network analysis and make use of natural language processing skillsto develop data driven applications.
Year / SEM: 3rdyear / 6th sem	**Year of Study : 2023-24**
Course Name:– Machine Learning-21AI63	
CO1	Understand the concept of Machine Learning and Concept Learning.
CO2	Apply the concept of ML and various classification methods in a project
CO3	Analyse various training models in ML and the SVM algorithm to be implemented
CO4	Apply the ML concept in a decision tree structure and implementation of Ensemble learning and Random Forest.
CO5	Apply Bayes techniques and explore more about the classification in ML.
Year / SEM: 3rdyear /6th sem	**Year of Study : 2023-24**
Course Name:– Business Intelligence-21AI641	

CO1	Apply the basics of data and business to understand Decision Support systems and Business Intelligence framework.
CO2	Describe the significance of Computerized Decision Support, apply the basics of mathematics to Understand the mathematical modeling behind decision support.
CO3	Explain Data warehousing, its architecture and Extraction, Transformation, and Load (ETL) Processes.
CO4	Analyze the importance of knowledge management and explain its activities, approaches and Its implementation
CO5	Describe the Expert systems and analyze its development, discuss areas suitable for application of experts system.
Year / SEM: 3rdyear / 6th sem	**Year of Study : 2023-24**
Course Name:– Advanced Java Programming-21CS642	
CO1	Understanding the fundamental concepts of Enumerations and Annotations
CO2	Apply the concepts of Generic classes in Java programs
CO3	Demonstrate the concepts of String operations in Java
CO4	Develop web based applications using Java servlets and JSP
CO5	Illustrate database interaction and transaction processing in Java.
Year / SEM: 3rdyear / 6th sem	**Year of Study : 2023-24**
Course Name:– Natural Language Processing-21AI643	
CO1	Analyse the natural language text
CO2	Define the importance of natural language.
CO3	Understand the concepts Text mining
CO4	Illustrate information retrieval techniques.
Year / SEM: 3rdyear / 6th sem	**Year of Study : 2023-24**
Course Name:– Introduction To Data Structures-21CS651	
CO1	Express the fundamentals of static and dynamic data structure
CO2	Summarize the various types of data structure with their operations
CO3	Interpret various searching and sorting techniques
CO4	Choose appropriate data structure in problem solving.
CO5	Develop all data structures in a high level language for problem solving.
Year / SEM: 3rdyear / 6th sem	**Year of Study : 2023-24**
Course Name:– Introduction To Database Management Systems-21CS652	
CO1	Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS
CO2	Use Structured Query Language (SQL) for database manipulation
CO3	Design and build simple database systems
CO4	Develop application to interact with databases.
Year / SEM: 3rdyear / 6th sem	**Year of Study : 2023-24**
Course Name:– Introduction To Cyber Security-21CS653	
CO1	Describe the cyber crime terminologies
CO2	Analyze cybercrime in mobiles and wireless devices along with the tools for Cybercrime and prevention

CO3	Analyze the motive and causes for cybercrime, cybercriminals, and investigators
CO4	Apply the methods for understanding criminal case and evidence, detection standing criminal case and evidence.

Year / SEM: 3rdyear / 6th sem	Year of Study : 2023-24
Course Name:– Programming In Java- 21CS654	
CO1	Develop JAVA programs using OOP principles and proper program structuring.
CO2	Develop JAVA program using packages, inheritance and interface
CO3	Develop JAVA programs to implement error handling techniques using exception handling
CO4	Demonstrate string handling concepts using JAVA

Year / SEM: 3rdyear / 6th sem	Year of Study : 2023-24
Course Name:– Machine Learning Laboratory- 21AIL66	
CO1	Understand the Importance of different classification and clustering algorithms
CO2	Demonstrate the working of various algorithms with respect to training and test data sets
CO3	Illustrate and analyze the principles of Instance based and Reinforcement learning techniques.
CO4	Elicit the importance and Applications of Supervised and unsupervised machine learning
CO5	Compare and contrast the Bayes theorem principles and Q learning approach.

Year / SEM: 4thyear / 7thsem	Year of Study : 2023-24
Course Name:– Advanced Ai And Ml-21AI71	
CO1	Demonstrate the fundamentals of Intelligent Agents
CO2	Illustrate the reasoning on Uncertain Knowledge
CO3	Explore the explanation-based learning in solving AI problems
CO4	Apply effectively ML algorithms to solve real world problems.
CO5	Apply Instant based techniques and derive effectively learning rules to real world problems
Year / SEM: 4thyear / 7thsem	**Year of Study : 2023-24**
Course Name:– Cloud Computing-21CS72	
CO1	Identify different data structures and their applications
CO2	Apply stack and queues in solving problems.
CO3	Demonstrate applications of linked list.
CO4	Explore the applications of trees and graphs to model and solve the real-world problem
CO5	Make use of Hashing techniques and resolve collisions during mapping of key value pairs
Year / SEM: 4thyear / 7thsem	**Year of Study : 2023-24**
Course Name:– Social Network Analysis-21AI731	
CO1	Understand the Semantic Web and Electronic sources for social network analysis
CO2	Understand the Representation, Modelling and Aggregating social network data
CO3	Analyse the human behaviour in social network.
CO4	Apply techniques for detection and decentralization of social network.
C05	Illustrate the visual representation of social network data.
Year / SEM: 4thyear / 7thsem	**Year of Study : 2023-24**
Course Name:– Digital Image Processing-21CS732	
CO1	Understand the fundamentals of Digital Image Processing.
CO2	Apply different Image transformation techniques
CO3	Analyze various image restoration techniques
CO4	Understand colour image and morphological processing
CO5	Design image analysis and segmentation techniques
Year / SEM: 4thyear / 7thsem	**Year of Study : 2023-24**
Course Name:– **Fullstack Development-21AI733**	
CO1	Understand the working of MVT based full stack web development with Django
CO2	Designing of Models and Forms for rapid development of web pages.
CO3	Analyze the role of Template Inheritance and Generic views for developing full stack web applications.
CO4	Apply the Django framework libraries to render nonHTML contents like CSV and PDF

C05	Perform jQuery based AJAX integration to Django Apps to build responsive full stack web applications,
Year / SEM: 4thyear / 7thsem	**Year of Study : 2023-24**
Course Name:– Blockchain Technology-21CS734	
CO1	Describe the concepts of Distrbuted computing and its role in Blockchain
CO2	Describe the concepts of Cryptography and its role in Blockchain
CO3	List the benefits, drawbacks and applications of Blockchain
CO4	Appreciate the technologies involved in Bitcoin
CO5	Appreciate and demonstrate the Ethereum platform to develop blockchain application
Year / SEM: 4thyear / 7thsem	**Year of Study : 2023-24**
Course Name:– Internet Of Things-21CS735	
CO1	Understand the evolution of IoT, IoT networking components, and addressing strategies in IoT.
CO2	Analyze various sensing devices and actuator types.
CO3	Demonstrate the processing in IoT.
CO4	Apply different connectivity technologies.
CO5	Understand the communication technologies , protocols and interoperability in IoT.
Year / SEM: 4thyear / 7thsem	**Year of Study : 2023-24**
Course Name:- Augmented Reality-21AI741	
CO1	Understand the importance of Augmented reality
CO2	Comprehend and analyse the Tracking system
CO3	Compare and Contrast the computer vision for Augmented reality
CO4	Analyse and understand Registration and camera simulation of visual coherence
CO5	Acquire knowledge of Situated Visualization

Year / SEM: 4thyear / 7th sem	**Year of Study : 2023-24**
Course Name:– Multiagent Systems-21CS742	
CO1	Demonstrate the decision process with different constraints
CO2	Analyze games in different forms
CO3	Apply the cooperative learning in developing games
CO4	Analyze different negotiation strategies of Multi-Agent System
CO5	Design and develop solutions for voting problems
Year / SEM: 4thyear / 7th sem	**Year of Study : 2023-24**
Course Name:– Predictive Analytics-21AI743	
CO1	Understand the importance of predictive analytics, able to prepare and process data for the models
CO2	Apply the statistical techniques for predictive models
CO3	Comprehend the transformation of data in the predictors
CO4	Apply regression and classification models for decision making and evaluate the performance
CO5	Apply and build the time series forecasting models in a variety of business contexts
Year / SEM: 4thyear / 7th sem	**Year of Study : 2023-24**
Course Name:– Robotic Process Automation Design And Development-21CS744	
CO1	To Understand the basic concepts of RPA

CO2	To Describe various components and platforms of RPA
CO3	To Describe the different types of variables, control flow and data manipulation techniques
CO4	To Understand various control techniques and OCR in RPA
CO5	To Describe various types and strategies to handle exceptions
Year / SEM: 4thear / 7thsem	**Year of Study : 2023-24**
Course Name:– Nosql Database- 21CS745	
CO1	Demonstrate an understanding of the detailed architecture of Column Oriented NoSQL databases, Document databases, Graph databases.
CO2	Use the concepts pertaining to all the types of databases
CO3	Analyze the structural Models of NoSQL
CO4	Develop various applications using NoSQL databases.
Year / SEM: 4thyear / 7th sem	**Year of Study : 2023-24**
Course Name:– Programming In Python- 21CS751	
CO1	Understand Python syntax and semantics and be fluent in the use of Python flow control and functions
CO2	Demonstrate proficiency in handling Strings and File Systems
CO3	Represent compound data using Python lists, tuples, Strings, dictionaries
CO4	Read and write data from/to files in Python Programs
Year / SEM: 4thyear / 7thsem	**Year of Study : 2023-24**
Course Name:– Introduction To Ai And Ml- 21CS752	
CO1	Design intelligent agents for solving simple gaming problems.
CO2	Have a good understanding of machine leaning in relation to other fields and fundamental issues and Challenges of machine learning
CO3	Understand data and applying machine learning algorithms to predict the outputs
CO4	Model the neuron and Neural Network, and to analyze ANN learning and its applications.

Year / SEM: 4thyear / 7th sem	Year of Study : 2023-24
Course Name:– Introduction To Big Data- 21CS753	
CO1	Master the concepts of HDFS and MapReduce framework
CO2	Investigate Hadoop related tools for Big Data Analytics and perform basic
CO3	Infer the importance of core data mining techniques for data analytics
CO4	Use Machine Learning algorithms for real world big data

Year / SEM: 4thyear / 7th sem	Year of Study : 2023-24
Course Name:– Introduction To Data Science- 2**1CS754**	
CO1	Describe the data science terminologies
CO2	Apply the Data Science process on real time scenario.
CO3	Analyze data visualization tools
CO4	Apply Data storage and processing with frameworks

PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES OF ALL DEPARTMENTS– 2023-24 (CRITERIA- 2)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

2.6.1 Program outcomes, program specific outcomes and course outcomes

Program Outcomes:

Program Outcomes (POs)
At the end of the B.E program, students are expected to have developed the following outcomes.
PO1: Apply the engineering knowledge of mathematics, science, engineering fundamentals with engineering specialization to the solution of complex engineering problems.
PO2: Identify, formulate, analyse and give solutions to complex engineering problems by reaching to substantiated conclusion using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: Use practical-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6: 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.

PO7: Understand the impact of the IoT enabled devices and the power of their and interaction leading to automation, in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO11: 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.
PO12: 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 (PSOs):	
The AIML graduates will have the ability to:	
PSO-1	Understand, apply, and demonstrate advanced technical skills in problem solving and leadership, as well as an understanding of system integration and the practical technological problems of end users.
PSO-2	An ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as other socio-economic constraints.

Academic Year: 2023-2024

Subject name: Mathematics for Computer Science **Sub. Code: BCS301**

CO	Description
At the end of the course, the student will be able to	
CO 1	Explain the basic concepts of probability, random variables, probability distribution
CO 2	Apply suitable probability distribution models for the given scenario
CO3	Apply the notion of a discrete-time Markov chain and n-step transition probabilities to solve the given problem
CO4	Use statistical methodology and tools in the engineering problem-solving process
CO5	Compute the confidence intervals for the mean of the population
CO6	Apply the ANOVA test related to engineering problems.

Subject name: Digital Design and Computer Organization **Sub. Code: BCS302**

CO	Description
At the end of the course, the student will be able to	
CO 1	Apply the K–Map techniques to simplify various Boolean expressions.
CO 2	Design different types of combinational and sequential circuits along with Verilog programs
CO3	Describe the fundamentals of machine instructions, addressing modes and Processor performance
CO4	Explain the approaches involved in achieving communication between processor and I/O devices
CO5	Analyze internal Organization of Memory and Impact of cache/Pipelining on Processor Performance.

Subject name: OPERATING SYSTEMS **Sub. Code: BCS303**

CO	Description
At the end of the course, the student will be able to	
CO 1	Explain the structure and functionality of operating system
CO 2	Apply appropriate CPU scheduling algorithms for the given problem.
CO3	Analyse the various techniques for process synchronization and deadlock handling.
CO4	Apply the various techniques for memory management
CO5	Explain file and secondary storage management strategies
CO6	Describe the need for information protection mechanisms

Subject name: DATA STRUCTURES AND APPLICATIONS **Sub. Code: BCS304**

CO	Description
At the end of the course, the student will be able to	
CO 1	Explain different data structures and their applications.
CO 2	Apply Arrays, Stacks and Queue data structures to solve the given problems
CO3	Use the concept of linked list in problem solving
CO4	Develop solutions using trees and graphs to model the real-world problem
CO5	Explain the advanced Data Structures concepts such as Hashing Techniques and Optimal Binary Search Trees.

Subject name: DATA STRUCTURES LABORATORY **Sub. Code: BCSL305**

CO	Description
At the end of the course, the student will be able to	
CO 1	Analyze various linear and non-linear data structures
CO 2	Demonstrate the working nature of different types of data structures and their applications
CO3	Use appropriate searching and sorting algorithms for the give scenario.
CO4	Apply the appropriate data structure for solving real world problems

Subject name: Object Oriented Programming with JAVA **Sub. Code: BCS306A**

CO	Description
At the end of the course, the student will be able to	
CO 1	Demonstrate proficiency in writing simple programs involving branching and looping structures.
CO 2	Design a class involving data members and methods for the given scenario
CO3	Apply the concepts of inheritance and interfaces in solving real world problems
CO4	Use the concept of packages and exception handling in solving complex problem
CO5	Apply concepts of multithreading, autoboxing and enumerations in program development

Subject name: Social Connect & Responsibility **Sub. Code: BSCK307**

CO	Description
At the end of the course, the student will be able to	
CO 1	Communicate and connect to the surrounding.
CO 2	Create a responsible connection with the society
CO3	Involve in the community in general in which they work
CO4	Notice the needs and problems of the community and involve them in problem –solving
CO5	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems
CO6	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

4th semester

Subject name: Analysis & Design of Algorithms **Sub. Code: BCS401**

CO	Description
At the end of the course, the student will be able to	
CO 1	Apply asymptotic notational method to analyze the performance of the algorithms in terms of time complexity
CO 2	Demonstrate divide & conquer approaches and decrease & conquer approaches to solve computational problems
CO3	Make use of transform & conquer and dynamic programming design approaches to solve the given real world or complex computational problems
CO4	Apply greedy and input enhancement methods to solve graph & string based computational problems
CO5	Analyse various classes (P,NP and NP Complete) of problems
CO6	Illustrate backtracking, branch & bound and approximation methods

Subject name: Advanced Java **Sub. Code: BIS402**

CO	Description
At the end of the course, the student will be able to	
CO 1	Apply appropriate collection class/interface to solve the given problem
CO 2	Demonstrate the concepts of String operations in Java
CO3	Apply the concepts of Swings to build Java applications
CO4	Develop web based applications using Java servlets and JSP
CO5	Use JDBC to build database applications

Subject name: Database Management System **Sub. Code: BCS403**

CO	Description
At the end of the course, the student will be able to	
CO 1	Describe the basic elements of a relational database management system
CO 2	Design entity relationship for the given scenario
CO3	Apply various Structured Query Language (SQL) statements for database manipulation
CO4	Analyse various normalization forms for the given application
CO5	Develop database applications for the given real world problem
CO6	Understand the concepts related to NoSQL databases

Subject name: Analysis & Design of Algorithms Lab **Sub. Code: BCSL404**

CO	Description
At the end of the course, the student will be able to	
CO 1	Develop programs to solve computational problems using suitable algorithm design strategy
CO 2	Compare algorithm design strategies by developing equivalent programs and observing running times for analysis (Empirical)
CO3	Make use of suitable integrated development tools to develop programs
CO4	Choose appropriate algorithm design techniques to develop solution to the computational and complex problems
CO5	Demonstrate and present the development of program, its execution and running time(s) and record the results/inferences

Subject name: Discrete Mathematical Structures **Sub. Code: BCS405A**

CO	Description
At the end of the course, the student will be able to	
CO 1	Apply concepts of logical reasoning and mathematical proof techniques in proving theorems and statements
CO 2	Demonstrate the application of discrete structures in different fields of computer science
CO3	Apply the basic concepts of relations, functions and partially ordered sets for computer representations
CO4	Solve problems involving recurrence relations and generating functions
CO5	Illustrate the fundamental principles of Algebraic structures with the problems related to computer science & engineering

5th Semester

Subject name: Automata Theory and Compiler Design **Sub. Code: 21CS51**

CO	Description
At the end of the course, the student will be able to	
CO 1	Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation
CO 2	Design and develop lexical analyzers, parsers and code generators
CO3	Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers

CO4	Acquire fundamental understanding of the structure of a Compiler and Apply concepts automata theory and Theory of Computation to design Compilers
CO5	Design computations models for problems in Automata theory and adaptation of such model in the field of compilers

Subject name: Computers Networks **Sub. Code: 21CS52**

CO	Description
At the end of the course, the student will be able to	
CO 1	Learn the basic needs of communication system
CO 2	Interpret the communication challenges and its solution
CO3	Identify and organize the communication system network components
CO4	Design communication networks for user requirements

Subject name: Database Management Systems **Sub. Code: 21CS53**

CO	Description
At the end of the course, the student will be able to	
CO 1	Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS
CO 2	Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of query evaluation
CO3	Design and build simple database systems and relate the concept of transaction, concurrency control and recovery in database
CO4	Develop application to interact with databases, relational algebra expression
CO5	Develop applications using tuple and domain relation expression from queries

Subject name: Artificial Intelligence and Machine Learning **Sub. Code: 21CS54**

CO	Description
At the end of the course, the student will be able to	
CO 1	Apply the knowledge of searching and reasoning techniques for different applications
CO 2	Have a good understanding of machine leaning in relation to other fields and fundamental issues and challenges of machine learning
CO3	Apply the knowledge of classification algorithms on various dataset and compare results
CO4	Model the neuron and Neural Network, and to analyze ANN learning and its applications
CO5	Identifying the suitable clustering algorithm for different pattern

Subject name: C# and .Net Framework **Sub. Code: 21CS582**

CO	Description
At the end of the course, the student will be able to	
CO 1	Able to explain how C# fits into the .NET platform
CO 2	Describe the utilization of variables and constants of C#
CO3	Use the implementation of object-oriented aspects in applications

CO4	Analyze and Set up Environment of .NET Core
CO5	Evaluate and create a simple project application

Subject name: Database Management Systems Laboratory with Mini Project Sub. Code: 21CSL55

CO	Description
At the end of the course, the student will be able to	
CO 1	Create, Update and query on the database
CO 2	Demonstrate the working of different concepts of DBMS
CO3	Implement, analyze and evaluate the project developed for an application

Subject name: Angular JS and Node JS Sub. Code: 21CSL581

CO	Description
At the end of the course, the student will be able to	
CO 1	Describe the features of Angular JS
CO 2	Recognize the form validations and controls
CO3	Implement Directives and Controllers
CO4	Evaluate and create database for simple application
CO5	Plan and build web-servers with node using Node .JS

6th Semester

Subject name: Software Engineering and Project Management Sub. Code: 21CS61

CO	Description
At the end of the course, the student will be able to	
CO 1	Understand the activities involved in software engineering and analyze the role of various process models
CO 2	Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques
CO3	Describe various software testing methods and to understand the importance of agile methodology and Dev-Ops
CO4	Illustrate the role of project planning and quality management in software development
CO5	Understand the importance of activity planning and different planning models

Subject name: Full stack Development Sub. Code: 21CS62

CO	Description
At the end of the course, the student will be able to	
CO 1	Understand the working of MVT based full stack web development with Django
CO 2	Designing of Models and Forms for rapid development of web pages
CO3	Analyze the role of Template Inheritance and Generic views for developing full stack web applications
CO4	Apply the Django framework libraries to render nonHTML contents like CSV and PDF

CO5	Perform jQuery based AJAX integration to Django Apps to build responsive full stack web applications

Subject name: Computer Graphics And Fundamentals Of Image Processing Sub. Code: 21CS63

CO	Description
At the end of the course, the student will be able to	
CO 1	Explain the Overview of Computer Graphics along with its applications
CO 2	Apply the concepts of Exploring 2D and 3D graphics mathematics along with OpenGL API's.
CO3	Analyze the Use of Computer graphics principles for animation and design of GUI's
CO4	Evaluate the suitable Image processing and Open CV.
CO5	Develop appropriate Image segmentation using Open CV

Subject name: AGILE TECHNOLOGIES Sub. Code: 21CS641

CO	Description
At the end of the course, the student will be able to	
CO 1	Understand To understand basics of agile technologies
CO 2	Apply explain XP Lifecycle, XP Concepts and Adopting XP
CO3	Analyze the Evaluate on Pair Programming, Root-Cause Analysis, Retrospectives, Planning, Incremental Requirements and Customer Tests
CO4	Evaluate To become Mastering in Agility
CO5	Design To provide well Deliver Value

Subject name: Advanced Java programming Sub. Code: 21CS642

CO	Description
At the end of the course, the student will be able to	
CO 1	Understand the fundamental concepts of Enumerations and Annotations
CO 2	Apply the concepts of Generic classes in Java programs
CO3	Demonstrate the fundamental concepts of String operations
CO4	Design and develop web applications using Java servlets and JSP
CO5	Apply database interaction through Java database Connectivity

Subject name: Advanced Computer Architecture Sub. Code: 21CS643

CO	Description
At the end of the course, the student will be able to	
CO 1	Explain the concepts of parallel computing
CO 2	Explain and identify the hardware technologies.
CO3	Compare and contrast the parallel architectures.
CO4	Illustrate parallel programming concepts

Subject name: DATA SCIENCE AND VISUALIZATION Sub. Code: 21CS644

CO	Description
At the end of the course, the student will be able to	
CO 1	CO 1. Understand the data in different forms.
CO 2	Apply different techniques to Explore Data Analysis and the Data Science Process
CO3	Analyze feature selection algorithms & design a recommender system.
CO4	Evaluate data visualization tools and libraries and plot graphs.
CO5	Develop different charts and include mathematical expressions

Subject name: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING Sub. Code: 18CS71

CO	Description
The student will be able to :	
CO1	Appraise the theory of Artificial intelligence and Machine Learning.
CO2	Illustrate the working of AI and ML Algorithms
CO3	Demonstrate the applications of AI and ML.

Subject name: BIG DATA AND ANALYTICS Sub. Code: 18CS72

CO	Description
The student will be able to :	
CO1	Understand fundamentals of Big Data analytics.
CO2	Investigate Hadoop framework and Hadoop Distributed File system
CO3	Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data
CO4	Demonstrate the MapReduce programming model to process the big data along with Hadoop tools
CO5	Use Machine Learning algorithms for real world big data
CO6	Analyze web contents and Social Networks to provide analytics with relevant visualization tools.

Subject name: SOFTWARE ARCHITECTURE AND DESIGN PATTERNS Sub. Code: 18CS731

CO	Description
The student will be able to :	
CO1	Design and implement codes with higher performance and lower complexity
CO2	Be aware of code qualities needed to keep code flexible
CO3	Experience core design principles and be able to assess the quality of a design with respect to these principles
CO4	Capable of applying these principles in the design of object oriented systems
CO5	Demonstrate an understanding of a range of design patterns. Be capable of comprehending a design presented using this vocabulary
CO6	Be able to select and apply suitable patterns in specific contexts

Subject name: HIGH PERFORMANCE COMPUTING Sub. Code: 18CS732

CO	Description
The student will be able to :	
CO1	Illustrate the key factors affecting performance of CSE applications •
CO2	Illusrate mapping of applications to high-performance computing systems
CO3	Apply hardware/software co-design for achieving performance on real-world applications

Subject name: ADVANCED COMPUTER ARCHITECTURES Sub. Code: 18CS733

CO	Description
The student will be able to :	
CO1	Explain the concepts of parallel computing and hardware technologies
CO2	Compare and contrast the parallel architectures
CO3	Illustrate parallel programming concepts

Subject name: USER INTERFACE DESIGN Sub. Code: 18CS734

CO	Description
The student will be able to :	
CO1	Design the User Interface, design, menu creation, windows creation and connection between menus and windows

Subject name: DIGITAL IMAGE PROCESSING Sub. Code: 18CS741

CO	Description
The student will be able to :	
CO1	Explain fundamentals of image processing
CO2	Compare transformation algorithms
CO3	Contrast enhancement, segmentation and compression techniques

Subject name: NETWORK MANAGEMENT Sub. Code: 18CS742

CO	Description
The student will be able to :	
CO1	Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets.
CO2	Apply network management standards to manage practical networks
CO3	Formulate possible approaches for managing OSI network model
CO4	Use on SNMP for managing the network
CO5	Use RMON for monitoring the behavior of the network
CO6	Identify the various components of network and formulate the scheme for the managing them

Subject name: NATURAL LANGUAGE PROCESSING Sub. Code: 18CS743

CO	Description
The student will be able to :	
CO1	Analyze the natural language text.
CO2	Define the importance of natural language
CO3	Understand the concepts Text mining
CO4	Illustrate information retrieval techniques

Subject name: CRYPTOGRAPHY Sub. Code: 18CS744

CO	Description
The student will be able to :	
CO1	Define cryptography and its principles
CO2	Explain Cryptography algorithms
CO3	Illustrate Public and Private key cryptography
CO4	Explain Key management, distribution and certification
CO5	Explain authentication protocols
CO6	Tell about IPSec

Subject name: ROBOTIC PROCESS AUTOMATION DESIGN & DEVELOPMENT Sub. Code: 18CS745

CO	Description
The student will be able to :	
CO1	To understand Basic Programming concepts and the underlying logic/structure
CO2	To Describe RPA , where it can be applied and how its implemented
CO3	To Describe the different types of variables, Control Flow and data manipulation techniques
CO4	To Understand Image, Text and Data Tables Automation
CO5	To Describe automation to Email and various types of Exceptions and strategies to handle

Subject name: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY Sub. Code: 18CSL76

CO	Description
The student will be able to :	
CO1	Implement and demonstrate AI and ML algorithms.
CO2	Evaluate different algorithms.
CO3	Demonstrate the applications of AI and ML.

Subject name : INTERNET OF THINGS Sub. Code: 18CS81

CO	Description
The student will be able to :	
CO1	Interpret the impact and challenges posed by IoT networks leading to new architectural models. •. •. •. •
CO2	Compare and contrast the deployment of smart objects and the technologies to connect them to network
CO3	Appraise the role of IoT protocols for efficient network communication
CO4	Elaborate the need for Data Analytics and Security in IoT
CO5	Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

Subject name: STORAGE AREA NETWORKS Sub. Code: 18CS822

CO	Description
The student will be able to :	
CO1	Identify key challenges in managing information and analyze different storage networking technologies and virtualization • • •
CO2	Explain components and the implementation of NAS
CO3	Describe CAS architecture and types of archives and forms of virtualization
CO4	Illustrate the storage infrastructure and management activities

PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES OF ALL DEPARTMENTS– 2023-24

(CRITERIA- 2)

Department of Electronics Communication and Engineering

2.6.1 Program outcomes, program specific outcomes and course outcomes

Program Outcomes:

Program Outcomes (POs)
At the end of the B.E program, students are expected to have developed the following outcomes.
PO1: Apply the engineering knowledge of mathematics, science, engineering fundamentals with engineering specialization to the solution of complex engineering problems.
PO2: Identify, formulate, analyse and give solutions to complex engineering problems by reaching to substantiated conclusion using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: Use practical-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: 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.
PO7: Understand the impact of the IoT enabled devices and the power of their and interaction leading to automation, in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO11: 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.
PO12: 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 (PSOs):	
The AIML graduates will have the ability to:	
PSO-1:	The ability to understand and apply principles of Electronics and Communication Engineering in the analysis, design and development of various types of integrated electronic systems as well as to interpret and synthesize the experimental data leading to valid conclusions.
PSO-2:	To solve real time problems with creative ideas, enabling the students to have successful career in industry and also motivate for higher education to promote research and development activities.

Course Outcomes:

Year / SEM : 2^{nd}year / 3^{rd}sem	**Year of Study : 2023-24**
Course Name: Mathematics-III for EC Engineering (BMATE 301)	
CO1	Demonstrate the Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing, and field theory.
CO2	To use Fourier transforms to analyze problems involving continuous-time signals
CO3	To apply Z-Transform techniques to solve difference equations
CO4	Understand that physical systems can be described by differential equations and solve such equations
CO5	Make use of correlation and regression analysis to fit a suitable mathematical model for statistical data

Year / SEM : 2nd year / 3rd sem	Year of Study : 2023-24
Course Name: Digital System Design using Verilog[BEC302]	
CO1	Simplify Boolean functions using K-map and Quine-McCluskey minimization technique..
CO2	Analyze and design for combinational logic circuits
CO3	Analyze the concepts of Flip Flops(SR, D,T and JK) and to design the synchronous sequential circuits using Flip Flops
CO4	Model Combinational circuits (adders, subtractors, multiplexers) and sequential circuits using Verilog descriptions
Year / SEM : 2ndyear / 3rdsem	**Year of Study : 2023-24**
Course Name: Electronic Principles and Circuits (BEC303)	
CO1	Understand the characteristics of BJTs and FETs for switching and amplifier circuits..
CO2	Design and analyze amplifiers and oscillators with different circuit configurations and biasing conditions
CO3	Understand the feedback topologies and approximations in the design of amplifiers and oscillators
CO4	Design of circuits using linear ICs for wide range applications such as ADC, DAC, filters and timers.
CO5	Understand the power electronic device components and its functions for basic power electronic circuits
Year / SEM : 2nd year / 3rd sem	**Year of Study : 2023-24**
Course Name: Network Analysis (BEC304)	
CO1	Determine currents and voltages using source transformation/ source shifting/ mesh/ nodal analysis and reduce given network using star- delta transformation
CO2	Solve problems by applying Network Theorems and electrical laws to reduce circuit complexities and to arrive at feasible solutions.
CO3	Analyse the circuit parameters during switching transients and apply Laplace transform to solve the given network
CO4	Evaluate the frequency response for resonant circuits and the network parameters for two port networks.
Year / SEM : 2nd year / 3rd sem	**Year of Study : 2023-24**
Course Name: Analog and Digital Systems Design Laboratory (BECL305)	
CO1	Design and analyze the BJT/FET amplifier and oscillator circuits.
CO2	Design and test Opamp circuits to realize the mathematical computations, DAC and precision rectifiers
CO3	Design and test the combinational logic circuits for the given specifications.
CO4	Test the sequential logic circuits for the given functionality.
CO5	Demonstrate the basic circuit experiments using 555 timer
Year / SEM : 2nd year / 3rd sem	**Year of Study : 2023-24**
Course Name: Computer Organization and Architecture (BEC 306C)	
CO1	Explain the basic organization of a computer system
CO2	Describe the addressing modes, instruction formats and program control statement

CO3	Explain different ways of accessing an input/ output device including interrupts.
CO4	Illustrate the organization of different types of semiconductor and other secondary storage memories
CO5	Illustrate simple processor organization based on hard wired control and microprogrammed control.
Year / SEM : 2nd year / 3rd sem	**Year of Study : 2023-24**
Course Name: C++ Basics (BECL358C)	
CO1	Write C++ program to solve simple and complex problems
CO2	Apply and implement major object-oriented concepts like message passing, function overloading, operator overloading and inheritance to solve real-world problems.
CO3	Use major C++ features such as Templates for data type independent designs and File I/O to deal with large data set
CO4	Analyze, design and develop solutions to real-world problems applying OOP concepts of C++
Year / SEM : 2nd year / 4 th sem	**Year of Study : 2023-24**
Course Name: Engineering Electromagnetics (BEC401)	
CO1	Evaluate problems on electrostatic force, electric field due to point, linear, volume charges by applying conventional methods and charge in a volume.
CO2	Apply Gauss law to evaluate Electric fields due to different charge distributions and Volume Charge distribution by using Divergence Theorem.
CO3	Calculate magnetic force, potential energy and Magnetization with respect to magnetic materials and voltage induced in electric circuits.
CO4	Demonstrate and explain Speed Control methods of three phase induction motor and types of single phase induction motors. 5 Understand the construction and operation, V and inverted V curves of synchronous motors.
CO5	Apply Maxwell's equations for time varying fields, EM waves in free space and conductors and Evaluate power associated with EM waves using Poynting theorem.
Year / SEM : 2nd year / 4 th sem	**Year of Study : 2023-24**
Course Name: PRINCIPLES OF COMMUNICATION SYSTEMS (BEC403)	
CO1	Understand the amplitude and frequency modulation techniques and perform time and frequency domain transformations.
CO2	Identify the schemes for amplitude and frequency modulation and demodulation of analog signals and compare the performance.
CO3	Characterize the influence of channel noise on analog modulated signals
CO4	Define the schemes for sampling, pulse amplitude modulation and pulse code modulation systems.
CO5	Design of circuits used in different stages of communication transmitters and receivers
Year / SEM : 2nd year / 4 th sem	**Year of Study : 2023-24**
Course Name: 8051 Microcontroller (BEC405A)	
CO1	Explain the difference between Microprocessors & Microcontrollers, Architecture of 8051 Microcontroller, Interfacing of 8051 to external memory and Instruction set of 8051.
CO2	Write 8051 Assembly level programs using 8051 instruction set

CO3	Explain the Interrupt system, operation of Timers/Counters and Serial port of 8051.
CO4	Write 8051 Assembly language program to generate timings and waveforms using 8051 timers, to send & receive serial data using 8051 serial port and to generate an external interrupt using a switch.
CO5	Write 8051 C programs to generate square wave on 8051 I/O port pin using interrupt and to send & receive serial data using 8051 serial port. Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motorto 8051 using 8051 I/O ports.
Year / SEM : 2nd year / 4 th sem	**Year of Study : 2023-24**
Course Name: Control Systems (BEC405D)	
CO1	Develop the mathematical model of mechanical and electrical systems
CO2	Develop transfer function for a given control system using block diagram reduction techniques and signal flow graph method..
CO3	Determine the time domain specifications for first and second order systems.
CO4	Determine the stability of a system in the time domain using Routh- Hurwitz criterion and Root-locus technique
CO5	Determine the stability of a system in the frequency domain using Nyquist and bode plots.
Year / SEM : 2nd year / 4 th sem	**Year of Study : 2023-24**
Course Name Embedded C Basics (BEC456A)	
CO1	Write C programs in 8051for solving simple problems that manipulate input data using different instructions
CO2	Develop testing and experimental procedures on 8051Microcontroller, analyze their operation under different cases.
CO3	Develop programs for 8051Microcontroller to implement real world problems.
CO4	Develop microcontroller applications using external hardware interface..
Year / SEM : 2nd year / 4 th sem	**Year of Study : 2023-24**
Course Name: Communication Laboratory (BECL404)	
CO1	Understand the basic concepts of RF transmitters and Receivers
CO2	Illustrate the AM and FM modulation generation and detection using suitable electronic circuits.
CO3	Design and test the sampling, Multiplexing and pulse modulation techniques using electronic hardware
CO4	Design and Demonstrate the electronic circuits used for RF transmitters and receivers..
Year / SEM : 3rd year / 5 th sem	**Year of Study : 2023-24**
Course Name: Digital Communication (21EC51)	
CO1	Analyze different digital modulation techniques and choose the appropriate modulation technique for the given specifications.
CO2	Test and validate symbol processing and performance parameters at the receiver under ideal and corrupted bandlimited channels..
CO3	Differentiate various spread spectrum schemes and compute the performance parameters of communication system
CO4	Apply the fundamentals of information theory and perform source coding for given message

CO5	Apply different encoding and decoding techniques with error Detection and Correction.
Year / SEM : 3rd year / 5 th sem	**Year of Study : 2023-24**
Course Name Computer Communication Networks (21EC53)	
CO1	Understand the concepts of networking thoroughly
CO2	Identify the protocols and services of different layers
CO3	Distinguish the basic network configurations and standards associated with each network..
CO4	Discuss and analyse the various applications that can be implemented on networks.
Year / SEM : 3rd year / 5 th sem	**Year of Study : 2023-24**
Course Name: Communication Simulink Toolbox (21EC582)	
CO1	Perform sampling, aliasing, filtering, and quadrature modulation through simulation.
CO2	Plot signal space representation of digital modulation techniques..
CO3	Design and implement a pulse shape and matched filter to avoid inter-symbol interference and maximize receiver SNR
CO4	Demonstrate advanced wireless communication techniques like Multipath fading, CCI etc. and model the same using MATLAB / Simulink
Year / SEM : 3rd year / 5 th sem	**Year of Study : 2023-24**
Course Name: Computer Organization & ARM Microcontrollers (21EC52)	
CO1	Explain the basic organization of a computer system
CO2	Demonstrate functioning of different sub systems, such as processor, Input/output, and memory.
CO3	Describe the architectural features and instructions of 32-bit microcontroller ARM Cortex M3..
CO4	Apply the knowledge gained for Programming ARM Cortex M3 for different applications.
Year / SEM : 3rd year / 5 th sem	**Year of Study : 2023-24**
Course Name: ELECTROMAGNETIC WAVES (21EC54)	
CO1	Evaluate problems on electrostatic force, electric field due to point, linear, volume charges by applying conventional methods and charge in a volume.
CO2	Apply Gauss law to evaluate Electric fields due to different charge distributions and Volume Charge distribution by using Divergence Theorem.
CO3	Determine potential and energy with respect to point charge and capacitance using Laplace equation and Apply Biot-Savart's and Ampere's laws for evaluating Magnetic field for different current configurations
CO4	Calculate magnetic force, potential energy and Magnetization with respect to magnetic materials and voltage induced in electric circuits..
CO5	Apply Maxwell's equations for time varying fields, EM waves in free space and conductors and Evaluate power associated with EM waves using Poynting theorem
Year / SEM : 3rd year / 5 th sem	**Year of Study : 2023-24**
Course Name: Communication Lab II (21ECL55)	
CO1	Design and test the digital modulation circuits and display the waveforms.
	To Implement the source coding algorithm using C/C++/ MATLAB code

CO2	
CO3	To Implement the Error Control coding algorithms using C/C++/ MATLAB code.
CO4	Illustrate the operations of networking concepts and protocols using C programming and network simulators..
Year / SEM : 3rdyear / 5 th sem	Year of Study : 2023-24
Course Name: Research Methodology & Intellectual Property Right (21RMI56)	
CO1	to know the meaning of engineering research.
CO2	To know the procedure of literature review and technical reading
CO3	To know the procedure fundamentals of patent laws and drafting procedure .
CO4	understanding the copyright laws and subject matters of copyrights and designs
CO5	Understanding the basic principles of design rights .
Year / SEM : 3rdyear / 6 th sem	**Year of Study : 2023-24**
Course Name: Renewable Energy Power Plants (21ME652)	
CO1	Describe the various forms of non-conventional energy resources.
CO2	Apply the fundamental knowledge of mechanical engineering to design various renewable energy systems
CO3	Analyse the implications of renewable energyforms for selecting an appropriate system for a specific application
CO4	Discuss on the environmental aspects and impact of non-conventional energy resources, in comparison with various conventional energy systems, their prospects and limitations.
Year / SEM : 3rdyear / 6 th sem	**Year of Study : 2023-24**
Course Name: TECHNOLOGICAL INNOVATION MANAGEMENT AND ENTREPRENEURSHIP (21EC61)	
CO1	Understand the fundamental concepts of Management and its functions
CO2	Understand the different functions to be performed by managers/Entrepreneur.
CO3	Understand the social responsibilities of a Business
CO4	Understand the Concepts of Entrepreneurship and to identify Business opportunities
CO5	Understand the components in developing a business plan and awareness about various sources of funding and Institutions supporting Entrepreneur.
Year / SEM : 3rdyear / 6 th sem	**Year of Study : 2023-24**
Course Name: VLSI Design and Testing(21EC63)	
CO1	Demonstrate understanding of MOS transistor theory, CMOS fabrication flow and technology scaling.
CO2	Draw the basic gates using the stick and layout diagram with the knowledge of physical design aspects
CO3	Interpret memory elements along with timing considerations..
CO4	Interpret testing and testability issues in combinational logic design.
CO5	Interpret testing and testability issues in combinational logic design.
Year / SEM : 3rdyear / 6 th sem	**Year of Study : 2023-24**
Course Name: VLSI Laboratory(21ECL66)	
CO1	Design and simulate combinational and sequential digital circuits using Verilog HDL.

CO2	Understand the synthesis process of digital circuits using EDA tool.
CO3	Perform ASIC design flow and understand the process of synthesis, synthesis constraints and evaluating the synthesis reports to obtain optimum gate level netlist.
CO4	Design and simulate basic CMOS circuits like inverter, common source amplifier, differential amplifier, SRAM
CO5	Perform RTL_GDSII flow and understand the stages in ASIC design.
Year / SEM : 3rd year / 6 th sem	**Year of Study : 2023-24**
Course Name :Cryptography (21EC642)	
CO1	Explain traditional cryptographic algorithms of encryption and decryption process..
CO2	Use symmetric and asymmetric cryptography algorithms to encrypt and decrypt the data..
CO3	Apply concepts of modern algebra in cryptography algorithms.
CO4	Design pseudo random sequence generation algorithms for stream cipher systems.
Year / SEM : 3rd year / 6 th sem	**Year of Study : 2023-24**
Course Name : Python Programming (21EC643)	
CO1	To acquire programming skills in Python..
CO2	To demonstrate data structure representation using Python
CO3	To develop the skill of pattern matching and files in Python.
CO4	To acquire Object Oriented Skills in Python
CO5	To develop the ability to write database applications in Python
Year / SEM : 3rd year / 6 th sem	**Year of Study : 2023-24**
Course Name : Microwave Theory and Antennas (21EC62)	
CO1	Describe the use and advantages of microwave transmission..
CO2	Analyze various parameters related to transmission lines.
CO3	Identify microwave devices for several applications..
CO4	Analyze various antenna parameters and their significance in building the RF system.
CO5	Identify various antenna configurations for suitable applications.
Year / SEM : 4 th year / 7 th sem	**Year of Study : 2023-24**
Course Name: COMPUTER NETWORKS– 18EC71	
CO1	Understand the concepts of networking thoroughly
CO2	Identify the protocols and services of different layers.
CO3	Distinguish the basic network configurations and standards associated with each network.
CO4	Analyze a simple network and measurement of its parameters.
Year / SEM : 4 th year / 7 th sem	**Year of Study : 2023-24**
Course Name: VLSI DESIGN– 18EC72	
CO1	Demonstrate understanding of MOS transistor theory, CMOS fabrication flow and technology scaling.
CO2	Draw the basic gates using the stick and layout diagrams with the knowledge of physical design aspects
CO3	Demonstrate ability to design Combinational, sequential and dynamic logic circuits as per the requirements

CO4	Interpret Memory elements along with timing considerations
CO5	Interpret testing and testability issues in VLSI Design
Year / SEM : 4 th year / 7 th sem	**Year of Study : 2023-24**
Course Name: **SATELLITE COMMUNICATION (Professional Elective) – 18EC732**	
CO1	Describe the satellite orbits and its trajectories with the definitions of parameters associated with it
CO2	Describe the electronic hardware systems associated with the satellite subsystem and earth station..
CO3	Describe the various applications of satellite with the focus on national satellite system.
CO4	Compute the satellite link parameters under various propagation conditions with the illustration of multiple access techniques.
Year / SEM : 4 th year / 7 th sem	**Year of Study : 2023-24**
Course Name: DIGITAL IMAGEPROCESSING– 18EC733	
CO1	Understand image formation and the role human visual system plays in perception of gray and color image data.
CO2	Apply image processing techniques in both the spatial and frequency (Fourier) domains.
CO3	• Design and evaluate image analysis techniques
CO4	Conduct independent study and analysis of Image Enhancement and restoration techniques
Year / SEM : 4 th year / 7 th sem	**Year of Study : 2023-24**
Course Name: MULTIMEDIA COMMUNICATION (Professional Elective)- 18EC743	
CO1	Understand basics of different multimedia networks and applications.
CO2	Understand different compression techniques to compress audio and video.
CO3	Describe multimedia Communication across Networks.
CO4	Analyse different media types to represent them in digital form.
CO5	Compress different types of text and images using different compression techniques.
Year / SEM : 4 th year / 7 th sem	**Year of Study : 2023-24**
Course Name: VLSI LAB (18ECL77)	
CO1	Design and simulate combinational and sequential digital circuits using Verilog HDL
CO2	Understand the Synthesis process of digital circuits using EDA tool.
CO3	Perform ASIC design flow and understand the process of synthesis, synthesis constraints and evaluating the synthesis reports to obtain optimum gate level net list
CO4	Design and simulate basic CMOS circuits like inverter, common source amplifier and differential amplifiers.
CO5	Perform RTL-GDSII flow and understand the stages in ASIC design.
Year / SEM : 4 th year / 7 th sem	**Year of Study : 2023-24**

Course Name: COMPUTER NETWORKS LAB-18ECL76	
CO1	Use the network simulator for learning and practice of networking algorithms..
CO2	Illustrate the operations of network protocols and algorithms using C programming.
CO3	Simulate the network with different configurations to measure the performance parameters.
CO4	Implement the data link and routing protocols using C programming.
Year / SEM : 4 th year / 8 th sem	**Year of Study : 2023-24**
Course Name: WIRELESS AND CELLULAR COMMUNICATION-18EC81	
CO1	Explain concepts of propagation mechanisms like Reflection, Diffraction, Scattering in wireless channels
CO2	Develop a scheme for idle mode, call set up, call progress handling and call tear down in a GSM cellular network.
CO3	Develop a scheme for idle mode, call set up, call progress handling and call tear down in a CDMA cellular network
CO4	Understand the Basic operations of Air interface in a LTE 4G system.
Year / SEM : 4 th year / 8 th sem	**Year of Study : 2023-24**
Course Name: NETWORK SECURITY(18EC821)	
CO1	Explain network security services and mechanisms and explain security concepts.
CO2	Understand the concept of Transport Level Security and Secure Socket Layer.
CO3	Explain Security concerns in Internet Protocol security
CO4	Explain Intruders, Intrusion detection and Malicious Software
CO5	Describe Firewalls, Firewall Characteristics, Biasing and Configuration.

Department of Electrical and Electronics and Engineering

2.6.1 Program outcomes, program specific outcomes and course outcomes

ProgramOutcomes:

PO1:Apply knowledge of mathematics and science, with fundamentals of electrical and electronics engineering so as to be able to solve complex engineering problems related to EEE.

PO2: Identify, formulate, research literature and analyze complex engineering problems using principles of mathematics, Science and Engineering Sciences

PO3:Design and conduct experiments, analyze and interpret data to develop electrical and electronics systems, electronic devices, software, and systems etc to meet desired needs within realistic constraints of economics, environmental, social, ethical, health and safety parameters.

PO4:Conduct investigation of complex Electrical & Electronics related problems using research based knowledge and research methods to provide logical conclusions.

PO5:Demonstrate usage of relevant modern tools to provide effective Electrical & Electronics Engineering solutions using the hardware and software based modelling, simulation, design and communication tools necessary for EEE practice.

PO6:Apply contextual knowledge based on informed reasoning to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7:Assess the impact of professional engineering solutions in societal and environmental contexts for

sustainable development.

PO8:Apply ethical principles and be conscious of ethical responsibilities and norms of EEE practice

PO9:Undertake individual responsibilities and to work as part of a team.

PO10:Communicate effectively in both verbal and written forms

PO11:Apply managerial principles to his/ her own work including financial implications and to manage project in multidisciplinary environments.

PO12:Recognize the need for, and be motivated to engage in life-long learning.

PROGRAM SPECIFIC OUTCOMES(PSOs):

Engineering Graduates will be able to:

PSO-1:	**Solve EEE problems like a pro -** Understand the latest technologies and models in the field of advanced engineering
PSO-2:	**Speak like an Executive** – Develop technical skills in presenting modern insights
PSO-3:	**Work like an innovator** – Complete the program with realistic ideas and employability skills

Course Outcomes:

Year / SEM : 2nd year / 3rd sem	Year of Study : 2023-24
Course Name: Mathematics-III for EE Engineering **(**BMATE 301**)**	
CO1	To acquaint the students with differential equations and their applications in electrical engineering
CO2	To find the association between attributes and the correlation between two variables
CO3	Learn to use Fourier series to represent periodical physical phenomena in engineering analysis and to enable the student to express non periodic functions to periodic function using Fourier series and Fourier transforms
CO4	To learn the basic ideas of the theory of probability and random signals

Year / SEM : 2nd year / 3rd sem	Year of Study : 2023-24
Course Name: ELECTRIC CIRCUIT ANALYSISTECHNIQUES(BEE302**)**	
CO1	Understand the basic concepts, basic laws and methods of analysis of DC and AC n e t wo r ks and reduce the complexity of network using source shifting, source transformation a n d n e t w o r k redu c ti on u s i n g transformations.
CO2	Solve complex electric circuits using network theorems.
CO3	Discuss resonance in series and parallel circuits and also the importance of initial conditions and their evaluation.
CO4	Synthesize typical waveforms using Laplace transformation.
CO5	Solve unbalanced three phase systems and also evaluate the performance of two port networks.

Year / SEM : 2nd year / 3rd sem	Year of Study : 2023-24
Course Name: Analog Electronic Circuits **(**BEE303)	
CO1	Utilize the characteristics of transistor for different applications.
CO2	Design and analyze biasing circuits for transistor
CO3	Design, analyze and test transistor circuitry as amplifiers and oscillators

Year / SEM : 2nd year / 3rd sem	Year of Study : 2023-24
Course Name: Transformers and Generators **(**BEE304**)**	
CO1	Explain the construction, working and various tests of single phase Transformer.
CO2	Explain the construction, working and parallel operation of three phase Transformer.
CO3	Explain the construction, working and analysis of Synchronous Generator.
CO4	Explain the construction, working of solar and wind power generators.

Year / SEM : 2nd year / 3rd sem	Year of Study : 2023-24
Course Name: Transformers and Generators Lab **(**BEEL305**)**	
CO1	Conduct various tests on transformers and synchronous machines and evaluate their performance.
CO2	Perform the parallel operation on two single phase transformers
CO3	Verify the performance of synchronous generator
CO4	Calculate the voltage regulation of an alternator using different methods for comparison.

Year / SEM : 2nd year / 3rd sem	Year of Study : 2023-24
Course Name: DIGITAL LOGIC CIRCUITS **(**BEE 306A**)**	
CO1	Explain the concept of combinational and sequential logic circuits
CO2	Analyse and design combinational circuits
CO3	Describe and characterize flip flops and its applications.
CO4	Design the sequential circuits using SR, JK, D and T flip-flops and Melay and Moore applications Design applications of combinational and sequential circuits
CO5	Employ the digital circuits for different applications

Year / SEM : 2nd year / 3rd sem	Year of Study : 2023-24
Course Name: Circuit Laboratory using P-spice **(**BEEL358C**)**	
CO1	Analyse in an intelligent manner, think better, and perform better..

Year / SEM : 2nd year / 4 th sem	Year of Study : 2023-24
Course Name: ELECTRIC MOTORS **(**BEE401**)**	
CO1	Understand the construction and operation, characteristics, Testing of DC Motors and determine losses and efficiency
CO2	Understand the construction and operation, classification and types of Three phase Induction motors..
CO3	Describe the performance characteristics and applications of three phase Induction motors.
CO4	Demonstrate and explain Speed Control methods of three phase induction motor and types of single phase induction motors. 5 Understand the construction and operation, V and inverted V curves of synchronous motors.
CO5	Construction and operation of Universal motor, AC servomotor, Linear induction motor, PMSM, SRM and BLDC motors.

Year / SEM : 2nd year / 4 th sem	Year of Study : 2023-24
Course Name: Transmission and Distribution **(**BEE402**)**	
CO1	Explain the structure of electrical power system, its components, advantages of high voltage AC and DC transmission, various conductors used for transmission, sag and its calculation
CO2	Explain various types of insulators and methods to improve string efficiency.

CO3	Explain the various transmission line parameters, their effects on transmission of electricity
CO4	Evaluate the parameters that influence the performance of transmission line and to calculate performance parameters of various transmission lines.
CO5	Explain carona and its effects, underground cable and its construction, classification, limitations and specifications.

Year / SEM : 2nd year / 4 th sem	**Year of Study : 2023-24**
Course Name: Microcontrollers **(**BEE403**)**	
CO1	Outline the 8051 architecture, registers, internal memory organization, addressing modes.
CO2	Discuss 8051 addressing modes, instruction set of 8051, accessing data and I/O port programming.
CO3	Develop 8051C programs for time delay, I/O operations, I/O bit manipulation, logic and arithmetic operations, data conversion and timer/counter programming.
CO4	Summarize the basics of serial communication and interrupts, also develop 8051 programs for serial data communication and interrupt programming
CO5	Program 8051to work with external devices for ADC, DAC, Stepper motor control, DC motor control and to Develop various 8051 based projects.

Year / SEM : 2nd year / 4 th sem	**Year of Study : 2023-24**
Course Name: Electric Motors Lab **(**BEEL404**)**	
CO1	Perform tests on DC Machines to determine their characteristics
CO2	Control the DC Motors using different methods.
CO3	Pre-determination the performance characteristics of DC Machines
CO4	Conduct load test on single-phase and three-phase Induction Motor and draw performance characteristics
CO5	Conduct test on Induction Motor to determine performance characteristics and to Conduct test on synchronous motor to draw performance curves.

Year / SEM : 2nd year / 4 th sem	Year of Study : 2023-24
Course Name: Electrical Power Generation and Economics **(**BEE405A**)**	
CO1	Explain the basics of hydro electric power plant, merits and demerits of hydroelectric power plants, site selection, arrangement and elements of hydro electric plan
CO2	Explain the working, site selection and arrangement of Steam, Diesel and Gas Power Plants.
CO3	Explain the working, site selection and arrangement of Nuclear Power Plants.
CO4	Explain the importance of different equipments in substation, Interconnection of power stations and different types of grounding.
CO5	Explain the economics of power generation.

Year / SEM : 2nd year / 4 th sem	Year of Study : 2023-24
Course Name: ARDUINO AND RASPBERRY PI **(**BEEL456D**)**	
CO1	. Explain the concepts of Internet of Things and its hardware and software components
CO2	Interface I/O devices, sensors & communication modules
CO3	Remotely monitor data and control devices
CO4	Develop real life IoT based projects.

Year / SEM : 3rd year / 5 th sem	Year of Study : 2023-24
Course Name: Transmission and Distribution **(**21EE51**)**	
CO1	Explain transmission and distribution scheme, identify the importance of different transmission systems and types of insulators.
CO2	Analyze and compute the parameters of the transmission line for different configurations.

CO3	Assess the performance of overhead lines.
CO4	Interpret corona, explain the use of underground cables.
CO5	Classify different types of distribution systems; examine its quality & reliability.

Year / SEM : 3rd year / 5 th sem	**Year of Study : 2023-24**
Course Name: Control Systems **(**21EE52**)**	
CO1	Analyze and model electrical and mechanical system using analogous.
CO2	Formulate transfer functions using block diagram and signal flow graphs.
CO3	Analyze the stability of control system, ability to determine transient and steady state time response.
CO4	Illustrate the performance of a given system in time and frequency domains, stability analysis using Root locus and Bode plots.
CO5	Discuss stability analysis using Nyquist plots, Design controller and compensator for a given specification

Year / SEM : 3rd year / 5 th sem	**Year of Study : 2023-24**
Course Name: Power System Analysis - 1 **(**21EE53**)**	
CO1	Model the power system components & construct per unit impedance diagram of power system
CO2	Analyze three phase symmetrical faults on power system.
CO3	Compute unbalanced phasors in terms of sequence components and vice versa, also develop sequence networks
CO4	Analyze various unsymmetrical faults on power system.
CO5	Examine dynamics of synchronous machine and determine the power system stability.

Year / SEM : 3rd year / 5 th sem	Year of Study : 2023-24
Course Name: Power Electronics **(**21EE54**)**	
CO1	To give an overview of applications power electronics, different types of power semiconductor devices, their switching characteristics, power diode characteristics, types, their operation and the effects of power diodes on RL circuits
CO2	To explain the techniques for design and analysis of single phase diode rectifier circuits
CO3	To explain different power transistors, their steady state and switching characteristics and limitations.
CO4	To explain different types of Thyristors, their gate characteristics and gate control requirements.
CO5	To explain the design, analysis techniques, performance parameters and characteristics of controlled rectifiers, DC- DC, DC -AC converters and Voltage controllers.

Year / SEM : 3rd year / 5 th sem	Year of Study : 2023-24
Course Name: Power Electronics Laboratory **(**21EEL55**)**	
CO1	Obtain static characteristics of semiconductor devices to discuss their performance.
CO2	Trigger the SCR by different methods
CO3	Verify the performance of single phase controlled full wave rectifier and AC voltage controller with R and RL loads.
CO4	Control the speed of a DC motor, universal motor and stepper motors.
CO5	Verify the performance of single phase full bridge inverter connected to resistive load.
Year / SEM : 3rdyear / 5 th sem	**Year of Study : 2023-24**
Course Name: Renewable Energy Projects **(**21EEP584**)**	
CO1	Analyse in a systematic way, think better, and perform better..

Year / SEM : 3rd year / 5 th sem	Year of Study : 2023-24

Course Name: MICROCONTROLLER LABORATORY (18EEL57/17EEL57)	
CO1	Write assembly language programs for data transfer, arithmetic, Boolean and logical instructions and code conversions.
CO2	Write ALP using subroutines for generation of delays, counters, configuration of SFRs for serial communication and timers
CO3	Perform interfacing of stepper motor and dc motor for controlling the speed, elevator, LCD, external ADC and temperature control.
CO4	Generate different waveforms using DAC interface.
CO5	Work with a small team to carryout experiments using microcontroller concepts and prepare reports that present lab work.

Year / SEM : 3rd year / 6 th sem	**Year of Study : 2023-24**
Course Name: Management and Entrepreneurship **(**21EE61**)**	
CO1	Explain the field of management, task of the manager, planning and steps in decision making.
CO2	Discuss the structure of organization, importance of staffing, leadership styles, modes of communication, techniques of coordination and importance of managerial control in business
CO3	Explain the concepts of entrepreneurship and a businessman's social responsibilities towards different groups
CO4	Show an understanding of role of SSI's in the development of country and state/central level institutions/ agencies supporting business enterprises.
CO5	Discuss the concepts of project management, capital budgeting, project feasibility studies, need for project report and new control techniques.

Year / SEM : 3rd year / 6 th sem	**Year of Study : 2023-24**
Course Name: Power System Analysis - 2 **(**21EE62**)**	
CO1	Formulate network matrices and models for solving load flow problem
CO2	Perform steady state power flow analysis of power systems using numerical iterative techniques..

CO3	. Solve issues of economic load dispatch and unit commitment problems
CO4	Analyze short circuit faults in power system networks using bus impedance matrix.
CO5	Apply Point by Point method and Runge Kutta Method to solve Swing Equation

Year / SEM : 3rd year / 6 th sem	**Year of Study : 2023-24**
Course Name: Signals and Digital Signal Processing **(**21EE63**)**	
CO1	Discuss classification and basic operations that can be performed on both continuous and discrete time signals.
CO2	Evaluate Discrete Fourier Transform of a sequence and the convolution of two sequences to determine the output sequence
CO3	Evaluate Discrete Fourier Transform of a sequence by using fast methods.
CO4	Design Butterworth and Chebyshev IIR digital filters and FIR filters using different techniques
CO5	Develop different structures for IIR and FIR filters.

Year / SEM : 3rd year / 6 th sem	**Year of Study : 2023-24**
Course Name: Sensors and Transducers **(**21EE641**)**	
CO1	Classify the transducers and explain the need of transducers, their classification, advantages and disadvantages
CO2	Explain the working of various transducers and sensors.
CO3	. Outline the recent trends in sensor technology and their selection

CO4	Analyze the signal conditioning and signal conditioning equipment and to Illustrate different configuration of Data Acquisition System and data conversion.
CO5	Show knowledge of data transmission and telemetry Explain measurement of non-electrical quantities -temperature, flow, speed, force, torque, power and viscosity

Year / SEM : 3rd year / 6 th sem	**Year of Study : 2023-24**
Course Name: Digital Signal Processing Laboratory (21EEL66)	
CO1	Conduct sampling of signals in time and frequency domains.
CO2	Evaluate the impulse response of a system.
CO3	Obtain convolution of given sequences to evaluate the response of a system.
CO4	Compute DFT and IDFT of a given sequence using the basic definition and/or fast methods.
CO5	Provide a solution for a given difference equation and to Design and implement IIR and FIR filters.

Year / SEM : 4 th year / 7 th sem	**Year of Study : 2023-24**
Course Name: POWER SYSTEM ANALYSIS – 2– 18EE71	
CO1	Formulate network matrices and models for solving load flow problems.
CO2	Perform steady state power flow analysis of power systems using numerical iterative techniques.
CO3	Suggest a method to control voltage profile.
CO4	Show knowledge of optimal operation of generators on a bus bar, optimal unit commitment,
CO5	Discuss optimal scheduling for hydro-thermal system, power system security and reliability.
CO6	Analyze short circuit faults in power system networks using bus impedance matrix.

CO7	Perform numerical solution of swing equation for multi-machine stability

Year / SEM : 4 th year / 7 th sem	**Year of Study : 2023-24**
Course Name: POWER SYSTEM PROTECTION– 18EE72	
CO1	Discuss performance of protective relays, components of protection scheme and relay terminology overcurrent protection.
CO2	Explain the working of distance relays and the effects ofarc resistance, power swings, line length and source impedance on performance of distance relays.
CO3	Discuss pilot protection; wire pilot relaying and carrier pilot relaying.
CO4	Discuss construction, operating principles and performance of differential relays for differential protection.
CO5	Discuss protection of generators, motors, Transformer and Bus Zone Protection.
CO6	Explain the principle of circuit interruption in different types of circuit breakers.
CO7	Describe the construction and operating principle of different types of fuses and to give the definitions of different terminologies related to a fuse.
CO8	Discuss protection against Overvoltages and Gas Insulated Substation (GIS)

Year / SEM : 4 th year / 7 th sem	**Year of Study : 2023-24**
Course Name: HIGH VOLTAGE ENGINEERING – 18EE73	
CO1	Explain conduction and breakdown phenomenon in gases, liquid dielectrics.

CO2	Explain breakdown phenomenon in solid dielectrics.
CO3	To explain different geological storage methods including storage in coal seams, depleted gas reservoirs
CO4	Explain generation of high voltages and currents
CO5	Discuss measurement techniques for high voltages and currents.
CO6	Discuss overvoltage phenomenon and insulation coordination in electric power systems.
CO7	Discuss non-destructive testing of materials and electric apparatus and high-voltage testing of electric apparatus

Year / SEM : 4 th year / 7 th sem	**Year of Study : 2023-24**
Course Name: ADVANCED CONTROL SYSTEMSS(Professional Elective) – 18EE741	
CO1	Discuss state variable approach for linear time invariant systems in both the continuous and discrete time systems.
CO2	Develop of state models for linear continuous – time and discrete – time systems.
CO3	Apply vector and matrix algebra to find the solution of state equations for linear continuous – time and discrete – time systems.
CO4	Define controllability and observability of a system and test for controllability and observability of a given system.
CO5	Design pole assignment and state observer using state feedback.
CO6	Develop the describing function for the nonlinearity present to assess the stability of the system.
CO7	Develop Lyapunov function for the stability analysis of nonlinear systems.

Year / SEM : 4 th year / 7 th sem	Year of Study : 2023-24
Course Name: UTILIZATION OF ELECTRICAL POWER(Professional Elective) – 18EE742	
CO1	Discuss electric heating, air-conditioning and electric welding.
CO2	Explain laws of electrolysis, extraction and refining of metals and electro deposition.
CO3	Explain the terminology of illumination, laws of illumination, construction and working of electric lamps.
CO4	Design interior and exterior lighting systems- illumination levels for factory lighting- flood lighting-street lighting.
CO5	Discuss systems of electric traction, speed time curves and mechanics of train movement.
CO6	Explain the motors used for electric traction and their control.
CO7	Discuss braking of electric motors, traction systems and power supply and other traction systems.
CO8	Explain the working of electric and hybrid electric vehicles.

Year / SEM : 4 th year / 7 th sem	Year of Study : 2023-24
Course Name: CARBON CAPTURE AND STORAGE(Professional Elective)-18EE743	
CO1	Discuss the impacts of climate change and the measures that can be taken to reduce emissions.
CO2	Discuss carbon capture and carbon storage.
CO3	Explain the fundamentals of power generation.
CO4	Explain methods of carbon capture from power generation and industrial processes.

CO5	Explain different carbon storage methods: storage in coal seams, depleted gas reservoirs and saline formations.
CO6	Explain Carbon dioxide compression and pipeline transport.

Year / SEM : 4 th year / 7 th sem	**Year of Study : 2023-24**
Course Name: POWER SYSTEM PLANNING (Professional Elective)–18EE744	
CO1	Discuss primary components of power system planning, planning methodology for optimum power system expansion, various types of generation, transmission and distribution.
CO2	Show knowledge of forecasting of future load requirements of both demand and energy by deterministic and statistical techniques using forecasting tools.
CO3	Discuss methods to mobilize resources to meet the investment requirement for the power sector
CO4	Understand economic appraisal to allocate the resources efficiently and appreciate the investment decisions
CO5	Discuss expansion of power generation and planning for system energy in the country, evaluation of operating states of transmission system, their associated contingencies and the stability of the system.
CO6	Discuss principles of distribution planning, supply rules, network development and the system studies
CO7	Discuss reliability criteria for generation, transmission, distribution and reliability evaluation and analysis, grid reliability, voltage disturbances and their remedies
CO8	Discuss planning and implementation of electric –utility activities, market principles and the norms framed by CERC for online trading and exchange in the interstate power market.

Year / SEM : 4 th year / 7 th sem	**Year of Study : 2023-24**
Course Name: FACTS AND HVDC TRANSMISSION (Professional Elective)-18EE751	
CO1	Discuss transmission interconnections, flow of Power in an AC System, limits of the loading capability, dynamic stability considerations of a transmission interconnection and controllable parameters.

CO2	Explain the basic concepts, definitions of flexible ac transmission systems and benefits from FACTS technology.
CO3	Describe shunt controllers, Static Var Compensator and Static Compensator for injecting reactive power in the transmission system in enhancing the controllability and power transfer capability.
CO4	Describe series Controllers Thyristor-Controlled Series Capacitor (TCSC) and the Static Synchronous Series Compensator (SSSC) for control of the transmission line current.
CO5	Explain advantages of HVDC power transmission, overview and organization of HVDC system
CO6	Describe the basic components of a converter, the methods for compensating the reactive power demanded by the converter.
CO7	Explain converter control for HVDC systems, commutation failure, control functions

Year / SEM : 4 th year / 7 th sem	Year of Study : 2023-24
Course Name: TESTING AND COMMISSIONING OF POWER SYSTEM APPARATUS(Professional Elective)– 18EE752	
CO1	Describe the process to plan, control and implement commissioning of electrical equipment's.
CO2	Differentiate the performance specifications of transformer and induction motor.
CO3	Demonstrate the routine tests for synchronous machine, induction motor, transformer & switchgears.
CO4	Describe corrective and preventive maintenance of electrical equipment's.
CO5	Explain the operation of an electrical equipment's such as isolators, circuit breakers, induction motorand synchronous machines.

Year / SEM : 4 th year / 7 th sem	Year of Study : 2023-24
Course Name: POWER SYSTEM SIMULATION LABORATORY–18EEL76	
CO1	Develop a program in MATLAB to assess the performance of medium and long transmission lines.
CO2	Develop a program in MATLAB to obtain the power angle characteristics of salient and non-salient pole alternator.
CO3	Develop a program in MATLAB to assess the transient stability under three phase fault at differen locations in a of radial power systems.
CO4	Develop programs in MATLAB to formulate bus admittance and bus impedance matrices of interconnected power systems.
CO5	Use Mi-Power package to solve power flow problem for simple power systems.
CO6	Use Mi-Power package to study unsymmetrical faults at different locations in radial power systems

CO7	Use of Mi-Power package to study optimal generation scheduling problems for thermal power plants.

Year / SEM : 4 th year / 7 th sem	**Year of Study : 2023-24**
Course Name: POWER SYSTEM SIMULATION LABORATORY–18EEL76	
CO1	Develop a program in MATLAB to assess the performance of medium and long transmission lines.
CO2	Develop a program in MATLAB to obtain the power angle characteristics of salient and non-salient pole alternator.
CO3	Develop a program in MATLAB to assess the transient stability under three phase fault at different locations in a of radial power systems.
CO4	Develop programs in MATLAB to formulate bus admittance and bus impedance matrices of interconnected power systems.
CO5	Use Mi-Power package to solve power flow problem for simple power systems.
CO6	Use Mi-Power package to study unsymmetrical faults at different locations in radial power systems
CO7	Use of Mi-Power package to study optimal generation scheduling problems for thermal power plants.

Year / SEM : 4 th year / 7 th sem	**Year of Study : 2023-24**
Course Name: RELY AND HIGH VOLTAGE LABORATORY–18EEL77	
CO1	Experimentally verify the characteristics of over current, over voltage, under voltage and negative sequence relays both electromagnetic and static type.
CO2	Experimentally verify the characteristics of microprocessor based over current, over voltage, under voltage relays and distance relay.
CO3	Show knowledge of protecting generator, motor and feeders.

CO4	Analyze the spark over characteristics for both uniform and non-uniform configurations using High AC nd DC voltages
CO5	Measure high AC and DC voltages and breakdown strength of transformer oil**.**
CO6	**Draw electric field and** measure the capacitance of different electrode configuration models.
CO7	Show knowledge of generating standard lightning impulse voltage to determine efficiency, energy ofimpulse generator and 50% probability flashover voltage for air insulation.

Year / SEM : 4 th year / 7 th sem	**Year of Study : 2023-24**
Course Name: PROJECT PHASE – I AND SEMINAR–18EEP78	
CO1	Demonstrate a sound technical knowledge of their selected project topic.
CO2	Undertake problem identification, formulation and solution.
CO3	Design engineering solutions to complex problems utilising a systems approach.
CO4	Communicate with engineers and the community at large in written an oral forms.
CO5	Demonstrate the knowledge, skills and attitudes of a professional engineer.

Year / SEM : 4 th year / 8 th sem	**Year of Study : 2023-24**
Course Name: POWER SYSTEM OPERATION AND CONTROL(Core Course) – 18EE81	
CO1	Describe various levels of controls in power systems, the vulnerability of the system,components, architecture and configuration of SCADA.
CO2	Solve unit commitment problems

CO3	Explain issues of hydrothermal scheduling and solutions to hydro thermal problems
CO4	Explain basic generator control loops, functions of Automatic generation control, speed governors
CO5	Develop and analyze mathematical models of Automatic Load Frequency Control
CO6	Explain automatic generation control, voltage and reactive power control in an interconnected power system.
CO7	Explain reliability, security, contingency analysis, state estimation and related issues of power systems.■

Year / SEM : 4 th year / 8 th sem	**Year of Study : 2023-24**
Course Name: INDUSTRIAL DRIVES AND APPLICATIONS(Core Course) –18EE82	
CO1	Explain the advantages and choice of electric drive.
CO2	Explain dynamics and different modes of operation of electric drives.
CO3	Suggest a motor for a drive and control of dc motor using controlled rectifiers.
CO4	Analyze the performance of induction motor drives under different conditions.
CO5	Control induction motor, synchronous motor and stepper motor drives.
CO6	Suggest a suitable electrical drive for specific application in the industry.

Year / SEM : 4 th year / 8 th sem	**Year of Study : 2023-24**

Course Name: OPERATION AND MAINTENANCE OF SOLAR ELECTRICSYSTEMS (Professional Elective)–18EE832	
CO1	Discuss basics of solar resource data, its acquisition and usage.
CO2	Explain PV technology, buying the PV modules and connecting the modules to form arrays.
CO3	Explain the use of inverters, other system components, cabling used to connect the components and mounting methods of the PV system.
CO4	Assess the site for PV system installation.
CO5	Design a grid connected system and compute its size.
CO6	Explain installation, commissioning, operation and maintenance of PV systems.
CO7	Explain the types of financial incentives available, calculation of payback time

Year / SEM : 4 th year / 8 th sem	**Year of Study : 2023-24**
Course Name: INTERNSHIP / PROFESSIONAL PRACTICE –18EE84	
CO1	Gain practical experience within industry in which the internship is done.
CO2	Acquire knowledge of the industry in which the internship is done.
CO3	Apply knowledge and skills learned to classroom work.
CO4	Develop a greater understanding about career options while more clearly defining personal career goals
CO5	Experience the activities and functions of professionals.

Year / SEM : 4 th year / 8 th sem	Year of Study : 2023-24
Course Name: PROJECT WORK PHASE -II–18EEP85	
CO1	Present the project and be able to defend it.
CO2	Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
CO3	Habituated to critical thinking and use problem solving skills
CO4	Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
CO5	Work in a team to achieve common goal.
CO6	Learn on their own, reflect on their learning and take appropriate actions to improve it.

Year / SEM : 4 th year / 8 th sem	Year of Study : 2023-24
Course Name: SEMINAR18EES86	
CO1	Attain, use and develop knowledge in the field of electrical and electronics engineering and other disciplines through independent learning and collaborative study.
CO2	Identify, understand and discuss current, real-time issues
CO3	Improve oral and written communication skills
CO4	Explore an appreciation of the self in relation to its larger diverse social and academic contexts.
CO5	Apply principles of ethics and respect in interaction with others.

PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES OF ALL DEPARTMENTS– 2023-24 (CRITERIA- 2)

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

2.6.1 Program outcomes, program specific outcomes and course outcomes

Program Outcomes:

Program Outcomes (POs)
At the end of the B.E program, students are expected to have developed the following outcomes.
PO1: Apply the engineering knowledge of mathematics, science, engineering fundamentals with engineering specialization to the solution of complex engineering problems.
PO2: Identify, formulate, analyse and give solutions to complex engineering problems by reaching to substantiated conclusion using first principles of mathematics, natural sciences, and engineering sciences.
PO3: 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.
PO4: Use practical-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6: 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.

PO7: Understand the impact of the IoT enabled devices and the power of their and interaction leading to automation, in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: 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.
PO11: 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.
PO12: 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 (PSOs):	
The AIML graduates will have the ability to:	
PSO-1	Understand the principles of Information Science and Engineering and enrich knowledge in recent advancements and developments in Information Technology.
PSO-2	Competent in programming and computing skills, ability to apply software development methodologies and modelling to solve real world problems in the field of Information Technology.

Academic Year: 2023-2024

Subject name: Mathematics for Computer Science Sub. Code: BCS301

CO	**Description**
At the end of the course, the student will be able to	
CO 1	Explain the basic concepts of probability, random variables, probability distribution
CO 2	Apply suitable probability distribution models for the given scenario
CO3	Apply the notion of a discrete-time Markov chain and n-step transition probabilities to solve the given problem
CO4	Use statistical methodology and tools in the engineering problem-solving process
CO5	Compute the confidence intervals for the mean of the population
CO6	Apply the ANOVA test related to engineering problems.

Subject name: Digital Design and Computer Organization Sub. Code: BCS302

CO	**Description**
At the end of the course, the student will be able to	
CO 1	Apply the K–Map techniques to simplify various Boolean expressions.

CO 2	Design different types of combinational and sequential circuits along with Verilog programs
CO3	Describe the fundamentals of machine instructions, addressing modes and Processor performance
CO4	Explain the approaches involved in achieving communication between processor and I/O devices
CO5	Analyze internal Organization of Memory and Impact of cache/Pipelining on Processor Performance.

Subject name: OPERATING SYSTEMS Sub. Code: BCS303

CO	Description
At the end of the course, the student will be able to	
CO 1	Explain the structure and functionality of operating system
CO 2	Apply appropriate CPU scheduling algorithms for the given problem.
CO3	Analyse the various techniques for process synchronization and deadlock handling.
CO4	Apply the various techniques for memory management
CO5	Explain file and secondary storage management strategies
CO6	Describe the need for information protection mechanisms

Subject name: DATA STRUCTURES AND APPLICATIONS Sub. Code: BCS304

CO	Description
At the end of the course, the student will be able to	
CO 1	Explain different data structures and their applications.
CO 2	Apply Arrays, Stacks and Queue data structures to solve the given problems
CO3	Use the concept of linked list in problem solving
CO4	Develop solutions using trees and graphs to model the real-world problem
CO5	Explain the advanced Data Structures concepts such as Hashing Techniques and Optimal Binary Search Trees.

Subject name: DATA STRUCTURES LABORATORY Sub. Code: BCSL305

CO	Description
At the end of the course, the student will be able to	
CO 1	Analyze various linear and non-linear data structures
CO 2	Demonstrate the working nature of different types of data structures and their applications
CO3	Use appropriate searching and sorting algorithms for the give scenario.
CO4	Apply the appropriate data structure for solving real world problems

Subject name: Object Oriented Programming with JAVA Sub. Code: BCS306A

CO	Description
At the end of the course, the student will be able to	
CO 1	Demonstrate proficiency in writing simple programs involving branching and looping structures.
CO 2	Design a class involving data members and methods for the given scenario

CO3	Apply the concepts of inheritance and interfaces in solving real world problems
CO4	Use the concept of packages and exception handling in solving complex problem
CO5	Apply concepts of multithreading, autoboxing and enumerations in program development

Subject name: Social Connect & Responsibility Sub. Code: BSCK307

CO	Description
At the end of the course, the student will be able to	
CO 1	Communicate and connect to the surrounding.
CO 2	Create a responsible connection with the society
CO3	Involve in the community in general in which they work
CO4	Notice the needs and problems of the community and involve them in problem –solving
CO5	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems
CO6	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

4th Semester

Subject name: Analysis & Design of Algorithms Sub. Code: BCS401

CO	Description
At the end of the course, the student will be able to	
CO 1	Apply asymptotic notational method to analyze the performance of the algorithms in terms of time complexity
CO 2	Demonstrate divide & conquer approaches and decrease & conquer approaches to solve computational problems
CO3	Make use of transform & conquer and dynamic programming design approaches to solve the given real world or complex computational problems
CO4	Apply greedy and input enhancement methods to solve graph & string based computational problems
CO5	Analyse various classes (P,NP and NP Complete) of problems
CO6	Illustrate backtracking, branch & bound and approximation methods

Subject name: Advanced Java Sub. Code: BIS402

CO	Description
At the end of the course, the student will be able to	
CO 1	Apply appropriate collection class/interface to solve the given problem
CO 2	Demonstrate the concepts of String operations in Java
CO3	Apply the concepts of Swings to build Java applications
CO4	Develop web based applications using Java servlets and JSP
CO5	Use JDBC to build database applications

Subject name: Database Management System Sub. Code: BCS403

CO	Description
At the end of the course, the student will be able to	

CO 1	Describe the basic elements of a relational database management system
CO 2	Design entity relationship for the given scenario
CO3	Apply various Structured Query Language (SQL) statements for database manipulation
CO4	Analyse various normalization forms for the given application
CO5	Develop database applications for the given real world problem
CO6	Understand the concepts related to NoSQL databases

Subject name: Analysis & Design of Algorithms Lab Sub. Code: BCSL404

CO	Description
At the end of the course, the student will be able to	
CO 1	Develop programs to solve computational problems using suitable algorithm design strategy
CO 2	Compare algorithm design strategies by developing equivalent programs and observing running times for analysis (Empirical)
CO3	Make use of suitable integrated development tools to develop programs
CO4	Choose appropriate algorithm design techniques to develop solution to the computational and complex problems
CO5	Demonstrate and present the development of program, its execution and running time(s) and record the results/inferences

Subject name: Discrete Mathematical Structures Sub. Code: BCS405A

CO	Description
At the end of the course, the student will be able to	
CO 1	Apply concepts of logical reasoning and mathematical proof techniques in proving theorems and statements
CO 2	Demonstrate the application of discrete structures in different fields of computer science
CO3	Apply the basic concepts of relations, functions and partially ordered sets for computer representations
CO4	Solve problems involving recurrence relations and generating functions
CO5	Illustrate the fundamental principles of Algebraic structures with the problems related to computer science & engineering

5th Semester

Subject name: Automata Theory and Compiler Design Sub. Code: 21CS51

CO	Description
At the end of the course, the student will be able to	
CO 1	Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation
CO 2	Design and develop lexical analyzers, parsers and code generators
CO3	Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers
CO4	Acquire fundamental understanding of the structure of a Compiler and Apply concepts automata theory and Theory of Computation to design Compilers
CO5	Design computations models for problems in Automata theory and adaptation of such model in the field of compilers

Subject name: Computers Networks Sub. Code: 21CS52

CO	Description
At the end of the course, the student will be able to	
CO 1	Learn the basic needs of communication system
CO 2	Interpret the communication challenges and its solution
CO3	Identify and organize the communication system network components
CO4	Design communication networks for user requirements

Subject name: Database Management Systems Sub. Code: 21CS53

CO	Description
At the end of the course, the student will be able to	
CO 1	Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS
CO 2	Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of query evaluation
CO3	Design and build simple database systems and relate the concept of transaction, concurrency control and recovery in database
CO4	Develop application to interact with databases, relational algebra expression
CO5	Develop applications using tuple and domain relation expression from queries

Subject name: Artificial Intelligence and Machine Learning Sub. Code: 21CS54

CO	Description
At the end of the course, the student will be able to	
CO 1	Apply the knowledge of searching and reasoning techniques for different applications
CO 2	Have a good understanding of machine leaning in relation to other fields and fundamental issues and challenges of machine learning
CO3	Apply the knowledge of classification algorithms on various dataset and compare results
CO4	Model the neuron and Neural Network, and to analyze ANN learning and its applications
CO5	Identifying the suitable clustering algorithm for different pattern

Subject name: C# and .Net Framework Sub. Code: 21CS582

CO	Description
At the end of the course, the student will be able to	
CO 1	Able to explain how C# fits into the .NET platform
CO 2	Describe the utilization of variables and constants of C#
CO3	Use the implementation of object-oriented aspects in applications
CO4	Analyze and Set up Environment of .NET Core
CO5	Evaluate and create a simple project application

Subject name: Database Management Systems Laboratory with Mini Project Sub. Code: 21CSL55

CO	Description
At the end of the course, the student will be able to	

CO 1	Create, Update and query on the database
CO 2	Demonstrate the working of different concepts of DBMS
CO3	Implement, analyze and evaluate the project developed for an application

Subject name: Angular JS and Node JS Sub. Code: 21CSL581

CO	Description
At the end of the course, the student will be able to	
CO 1	Describe the features of Angular JS
CO 2	Recognize the form validations and controls
CO3	Implement Directives and Controllers
CO4	Evaluate and create database for simple application
CO5	Plan and build web-servers with node using Node .JS

6th Semester

Subject name: Software Engineering and Project Management Sub. Code: 21CS61

CO	Description
At the end of the course, the student will be able to	
CO 1	Understand the activities involved in software engineering and analyze the role of various process models
CO 2	Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques
CO3	Describe various software testing methods and to understand the importance of agile methodology and Dev-Ops
CO4	Illustrate the role of project planning and quality management in software development
CO5	Understand the importance of activity planning and different planning models

Subject name: Full stack Development Sub. Code: 21CS62

CO	Description
At the end of the course, the student will be able to	
CO 1	Understand the working of MVT based full stack web development with Django
CO 2	Designing of Models and Forms for rapid development of web pages
CO3	Analyze the role of Template Inheritance and Generic views for developing full stack web applications
CO4	Apply the Django framework libraries to render nonHTML contents like CSV and PDF
CO5	Perform jQuery based AJAX integration to Django Apps to build responsive full stack web applications

Subject name: Software Testing Sub. Code: 21IS63

CO	Description

At the end of the course, the student will be able to	
CO 1	Explain the significance of software testing and quality assurance in software development
CO 2	Apply the concepts of software testing to assess the most appropriate testing method
CO3	Analyze the importance of testing in software development
CO4	Evaluate the suitable testing model to derive test cases for any given software
CO5	Develop appropriate document for the software artefact

Subject name: Data Mining and Data Warehousing Sub. Code: 21IS643

CO	**Description**
At the end of the course, the student will be able to	
CO 1	Understand warehousing architectures and tools for systematically organizing large database and use their data to make strategic decisions
CO 2	Apply KDD process for finding interesting pattern from warehouse
CO3	Analyze the kinds of patterns that can be discovered by association rule mining
CO4	Evaluate interesting patterns from large amounts of data to analyze for predictions and classification
CO5	Design select suitable methods for data mining and analysis

Subject name: Introduction to Data Structures Sub. Code: 21CS651

CO	**Description**
At the end of the course, the student will be able to	
CO 1	Express the fundamentals of static and dynamic data structure
CO 2	Summarize the various types of data structure with their operations
CO3	Interpret various searching and sorting techniques
CO4	Choose appropriate data structure in problem solving
CO5	Develop all data structures in a high level language for problem solving

Subject name: Introduction to Database Management Systems Sub. Code: 21CS652

CO	**Description**
At the end of the course, the student will be able to	
CO 1	Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS
CO 2	Use Structured Query Language (SQL) for database manipulation
CO3	Design and build simple database systems
CO4	Develop application to interact with databases

Subject name: Introduction to Cyber Security Sub. Code: 21CS653

CO	**Description**
At the end of the course, the student will be able to	

CO 1	Describe the cyber crime terminologies
CO 2	Analyze cybercrime in mobiles and wireless devices along with the tools for Cybercrime and prevention
CO3	Analyze the motive and causes for cybercrime, cybercriminals, and investigators
CO4	Apply the methods for understanding criminal case and evidence, detection standing criminal case and evidence

Subject name: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING Sub. Code: 18CS71

CO	Description
The student will be able to :	
CO1	Appraise the theory of Artificial intelligence and Machine Learning.
CO2	Illustrate the working of AI and ML Algorithms
CO3	Demonstrate the applications of AI and ML.

Subject name: BIG DATA AND ANALYTICS Sub. Code: 18CS72

CO	Description
The student will be able to :	
CO1	Understand fundamentals of Big Data analytics.
CO2	Investigate Hadoop framework and Hadoop Distributed File system
CO3	Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data
CO4	Demonstrate the MapReduce programming model to process the big data along with Hadoop tools
CO5	Use Machine Learning algorithms for real world big data
CO6	Analyze web contents and Social Networks to provide analytics with relevant visualization tools.

Subject name: SOFTWARE ARCHITECTURE AND DESIGN PATTERNS Sub. Code: 18CS731

CO	Description
The student will be able to :	
CO1	Design and implement codes with higher performance and lower complexity
CO2	Be aware of code qualities needed to keep code flexible
CO3	Experience core design principles and be able to assess the quality of a design with respect to these principles
CO4	Capable of applying these principles in the design of object oriented systems
CO5	Demonstrate an understanding of a range of design patterns. Be capable of comprehending a design presented using this vocabulary
CO6	Be able to select and apply suitable patterns in specific contexts

Subject name: HIGH PERFORMANCE COMPUTING Sub. Code: 18CS732

CO	Description
The student will be able to :	
CO1	Illustrate the key factors affecting performance of CSE applications •
CO2	Illusrate mapping of applications to high-performance computing systems
CO3	Apply hardware/software co-design for achieving performance on real-world applications

Subject name: ADVANCED COMPUTER ARCHITECTURES Sub. Code: 18CS733

CO	Description
The student will be able to :	
CO1	Explain the concepts of parallel computing and hardware technologies
CO2	Compare and contrast the parallel architectures
CO3	Illustrate parallel programming concepts

Subject name: USER INTERFACE DESIGN Sub. Code: 18CS734

CO	Description
The student will be able to :	
CO1	Design the User Interface, design, menu creation, windows creation and connection between menus and windows

Subject name: DIGITAL IMAGE PROCESSING Sub. Code: 18CS741

CO	Description
The student will be able to :	
CO1	Explain fundamentals of image processing
CO2	Compare transformation algorithms
CO3	Contrast enhancement, segmentation and compression techniques

Subject name: NETWORK MANAGEMENT Sub. Code: 18CS742

CO	Description
The student will be able to :	
CO1	Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets.
CO2	Apply network management standards to manage practical networks
CO3	Formulate possible approaches for managing OSI network model
CO4	Use on SNMP for managing the network
CO5	Use RMON for monitoring the behavior of the network
CO6	Identify the various components of network and formulate the scheme for the managing them

Subject name: NATURAL LANGUAGE PROCESSING Sub. Code: 18CS743

CO	Description
The student will be able to :	
CO1	Analyze the natural language text.
CO2	Define the importance of natural language
CO3	Understand the concepts Text mining
CO4	Illustrate information retrieval techniques

Subject name: CRYPTOGRAPHY Sub. Code: 18CS744

CO	Description
The student will be able to :	
CO1	Define cryptography and its principles
CO2	Explain Cryptography algorithms
CO3	Illustrate Public and Private key cryptography
CO4	Explain Key management, distribution and certification
CO5	Explain authentication protocols
CO6	Tell about IPSec

Subject name: ROBOTIC PROCESS AUTOMATION DESIGN & DEVELOPMENT Sub. Code: 18CS745

CO	Description
The student will be able to :	
CO1	To understand Basic Programming concepts and the underlying logic/structure
CO2	To Describe RPA , where it can be applied and how its implemented
CO3	To Describe the different types of variables, Control Flow and data manipulation techniques
CO4	To Understand Image, Text and Data Tables Automation
CO5	To Describe automation to Email and various types of Exceptions and strategies to handle

Subject name: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY Sub. Code: 18CSL76

CO	Description
The student will be able to :	
CO1	Implement and demonstrate AI and ML algorithms.
CO2	Evaluate different algorithms.
CO3	Demonstrate the applications of AI and ML.

Subject name : INTERNET OF THINGS Sub. Code: 18CS81

CO	Description
The student will be able to :	
CO1	Interpret the impact and challenges posed by IoT networks leading to new architectural models. ●. ●. ●. ●
CO2	Compare and contrast the deployment of smart objects and the technologies to connect them to network
CO3	Appraise the role of IoT protocols for efficient network communication
CO4	Elaborate the need for Data Analytics and Security in IoT
CO5	Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

Subject name: STORAGE AREA NETWORKS Sub. Code: 18CS822

CO	Description
The student will be able to :	
CO1	Identify key challenges in managing information and analyze different storage networking technologies and virtualization ● ● ●
CO2	Explain components and the implementation of NAS
CO3	Describe CAS architecture and types of archives and forms of virtualization
CO4	Illustrate the storage infrastructure and management activities

PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES OF ALL DEPARTMENTS– 2023-24

(CRITERIA- 2)

Department of Management studies

2.6.1 Program outcomes, program specific outcomes and course outcomes

Program Outcomes:

Program Outcomes (POs)
At the end of the MBA program, students are expected to have developed the following outcomes.
PO1: Apply knowledge of management theories and practices to solve business problems.
PO2: Foster analytical and critical thinking abilities for data-based decision making.
PO3: Ability to develop value-based leadership.
PO4: Ability to understand, analyse and communicate global, economic, legal and ethical aspects of business.
PO5: Ability to lead themselves and others in the achievement of organizational goals contributing effectively to a team environment.

PROGRAM SPECIFIC OUTCOMES (PSOs):	
Engineering Graduates will be able to:	
PSO-1:	Comprehend the contemporary features and characteristics of Business Management Science and its administration
PSO-2:	Analyse and interpret the dynamic situations for making Business Management strategies and decisions at the national and global level
PSO-3:	Handle responsibility with the ethical values for all actions undertaken by them.

PSO-4:	Adapt and focus on achieving the organisational goal and objectives with complete zeal and commitment

Course outcomes (COs)	
Year / SEM: 1st year / 1st sem	**Year of Study: 2023-24**
Course Name: – Principles of management and Organization Behaviour - 22MBA11	
CO1	Gain practical experience in the field of Management and Organisational Behaviour.
CO2	Acquire conceptual knowledge of management, various functions of Management and theories in OB.
CO3	Comprehend and apply management and behavioural models to relate attitude, perception and personality.
CO4	Analyse the recent trends in Management and OB models
CO5	Gain practical experience in the field of Management and Organisational Behaviour.
Year / SEM: 1st year / 1st sem	**Year of Study: 2023-24**
Course Name: – ENTREPRENEURSHIP DEVELOPMENT 22MBA12	
CO1	Display keen interest and orientation towards entrepreneurship, entrepreneurial opportunity Modules in order to setup a business and to think creatively.
CO2	To know about the various business models and B-Plans across Business sectors.
CO3	Able to understand the importance of marketing and different forms of businesses.
CO4	Become aware about various sources of funding and institutions supporting entrepreneurs.
CO5	Awareness about legal aspects and ways to protect the ideas
CO6	To understand the ways of starting a business and to know how to foster their ideas.
Year / SEM: 1st year / 1st sem	**Year of Study: 2023-24**
Course Name:–Accounting for Manager - 22MBA13	
CO1	Know what and how books of accounts and financial statements are prepared.
CO2	How to interpret financial statements of companies for decision making.
CO3	Independently undertake financial statement analysis and take decisions.
Year / SEM: 1st year / 1st sem	**Year of Study: 2023-24**
Course Name:–Statistics for Manager - 22MBA14	
CO1	Understand how to organize, manage, and present the data
CO2	Use and apply a wide variety of specific statistical tools
CO3	Understand the applications of probability in business
CO4	Effectively interpret the results of statistical analysis
CO5	Develop competence of using computer packages to solve the problems
Year / SEM: 1st year / 1st sem	**Year of Study: 2023-24**
Course Name: – Marketing Management -22MBA15	
CO1	Comprehend the concepts of Marketing Management
CO2	Gain knowledge on consumer behaviour and buying process
CO3	Understand concept of Product and Brand Management, Branding and Pricing strategies
CO4	Identify marketing channels and the concept of product distribution, techniques of sales promotion
CO5	Simply ideas into a viable marketing plan for various modes of marketing

Year / SEM: 1st year / 1st sem	Year of Study : 2023-24
Course Name: – Business Communication- 22MBA16	
CO1	The students will be aware of their communication skills and know their potential to become successful managers.
CO2	The students will get enabled with the mechanics of writing and can compose the business letters in English precisely and effectively.
CO3	The students will be introduced to the managerial communication practices in business those are in vogue
CO4	Students will get trained in the art of drafting business proposals and business communication with emphasis on analyzing business situations.
CO5	The students will be aware of their communication skills and know their potential to become successful managers.
Year / SEM: 1st year / 2nd Sem	**Year of Study: 2023-24**
Course Name: – Human Resource Management – 22MBA21	
CO1	Understand and gain practical experience in the field of Human Resource Concepts, functions and theories.
CO2	Acquire conceptual insight of Human Resource and various functions of HR.
CO3	Apply personnel, managerial and welfare aspects of HR.
CO4	Perceive greater understanding about HR practices
CO5	Perceive knowledge about the future trends in HRM
Year / SEM: 1st year / 2nd Sem	**Year of Study: 2023-24**
Course Name: – Financial Management - 22MBA22	
CO1	Understand the basic financial concepts
CO2	Apply time value of money
CO3	Evaluate the investment decisions
CO4	Estimate working capital requirements
CO5	Analyze the capital structure and dividend decisions

Year / SEM: 1st year / 2nd sem	Year of Study: 2023-24
Course Name: – Research Methodology and IPR – 22MBA23	
CO1	Understand various research approaches, techniques and strategies in the appropriate in business.
CO2	Apply a range of quantitative / qualitative research techniques to business and day to day management problems.
CO3	Demonstrate knowledge and understanding of data analysis, interpretation and report writing.
CO4	Develop necessary critical thinking skills in order to evaluate different research approaches in Business.
CO5	Discuss various forms of the intellectual property, its relevance and business impact in the changing global business environment and leading International Instruments concerning IPR.
Year / SEM: 1st year / 2nd Sem	**Year of Study : 2023-24**
Course Name: – OPERATIONS RESEARCH - 22MBA24	
CO1	Get an insight into the fundamentals of Operations Research and its definition, characteristics and phases
CO2	Use appropriate quantitative techniques to get feasible and optimal solutions
CO3	Understand the usage of game theory, Queuing Theory and Simulation for Solving Business Problems
CO4	Understand and apply the network diagram for project completion

Year / SEM: 1st year / 2nd sem	Year of Study : 2023-24
Course Name:– STRATEGIC MANAGEMENT- 22MBA25	
CO1	Students should get clear idea about the concept of Strategic Management, its relevance, Characteristics, process nature and purpose.
CO2	Student to acquire an understanding of how firms successfully institutionalize a strategy and create an organizational structure for domestic and overseas operations and gain competitive advantage.
CO3	To give the students an insight on strategy at different levels of an organization to gain competitive advantage.
CO4	To help students understand the strategic drive-in multinational firms and their decisions in different markets
CO5	Students should get clear idea about the concept of Strategic Management, its relevance, Characteristics, process nature and purpose.
Year / SEM: 1st year / 2nd Sem	**Year of Study: 2023-24**
Course Name: – MANAGERIAL ECONOMICS-22MBA26	
CO1	The student will understand the application of Economic Principles in Management decision making
CO2	The student will earn the microeconomic concepts and apply them for effective functioning of a Firm and Industry.
CO3	The student will be able to understand, assess and forecast the demand.
CO4	The student will apply the concepts of production and cost for optimization of production
CO5	The student will design competitive strategies like pricing, product differentiation etc. and marketing according to the market structure
CO6	The student will be able to understand the impact of macroeconomic concepts.
Year / SEM: 2ndyear / 3rd Sem	**Year of Study : 2023-24**
Course Name: – LOGISTICS AND SUPPLY CHAIN MANAGEMENT – 22MBA301	
CO1	Demonstrate knowledge of the functions of logistics and supply chain management.
CO2	Relate concepts and activities of the supply chain to actual organizations
CO3	Analyse the role of technology in logistics and supply chain management
CO4	Evaluate cases for effective supply chain management and its implementation.
Year / SEM: 2ndyear / 3rd sem	**Year of Study : 2023-24**
Course Name: – Information Technology for Managers -22MBA302	
CO1	Understand the importance of Information technology for business
CO2	Develop insights into technology and investigate its impact on Business
CO3	Understand Various Measures of Technology available in corporate world.
CO4	Understanding how creativity and innovative Technologies help to find a solution to problems.
Year / SEM: 2ndyear / 3rd sem	**Year of Study : 2023-24**
Course Name: – Strategic Cost Management - 22MBAFM303	
CO1	Understand the goals and strategies of business units.
CO2	Determine standard costing and variance analysis cost control in Business decision making,
CO3	Applications of Management accounting and control systems in Corporate
CO4	Critically evaluate all traditional and non-traditional costing methods such as absorption costing; marginal costing and activity based costing.
Year / SEM: 2ndyear / 3rd sem	**Year of Study : 2023-24**
Course Name: – SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT – 22MBAFM304	
CO1	Understand the capital market and various Instruments for Investment
CO2	Assess the risk and return associated with investments and methods to value securities.

CO3	Analyze the Economy, Industry and Company framework for Investment.
CO4	Learn the theories of Portfolio management and also the tools and techniques for efficient portfolio management.

Year / SEM: 2ndyear / 3rd sem	**Year of Study: 2023-24**
Course Name: – CONSUMER BEHAVIOUR - 22MBAMM303	
CO1	The students will be able understand the background and concepts of consumer behaviour.
CO2	The students will be able to identify the dynamics of consumer behaviour and the basic factors that influence the consumers decision process
CO3	The students will be able to demonstrate how concepts may be applied to marketing strategy.
CO4	Students will be able to apply and demonstrate theories to real world marketing situations by profiling and identifying marketing segments.
Year / SEM: 2ndyear / 3rd sem	**Year of Study : 2023-24**
Course Name: – Sales and Retail Management – 22MBAMM304	
CO1	Understand the selling techniques in an organisation.
CO2	Develop a plan for organizing, staffing & training sales force.
CO3	Organize sales territories to maximize selling effectiveness
CO4	Evaluate sales management strategies
CO5	Find out the contemporary retail management issues and strategies
CO6	Evaluate the recent trends in retailing and its impact in the success of modern business.
CO7	Understand Relate store management and visual merchandising practices for effective retailing.
Year / SEM: 2ndyear / 3rd sem	**Year of Study : 2023-24**
Course Name: – Recruitment and Selection - 22MBAHR303	
CO1	Gain the practical insight of various principles and practices of recruitment and selection.
CO2	Acquire knowledge of latest conceptual framework used in recruitment and selection process and procedure applied in various industries.
CO3	Illustrate the application of recruitment and selection tools and techniques in various sectors.
CO4	Develop a greater understanding about strategies for workforce planning and assessment, analyse the hiring management system followed in various industries.
Year / SEM: 2ndyear / 3rd sem	**Year of Study: 2023-24**
Course Name:– Industrial Relations And legislations - 22MBAHR304	
CO1	Gain practical experience related to labour legislations in India across various sectors.
CO2	Acquire conceptual knowledge of Industrial relations and labour laws followed within industries.
CO3	Develop the greater understanding of IR concepts and its application in solving various issues in IR.
CO4	Apply the IR and labour laws concepts in various industries in India.
Year / SEM: 2ndyear / 3rd sem	**Year of Study : 2023-24**
Course Name:– Introduction to Python, Data and Control Systems – 22MBABA303	
CO1	Understand the concepts of python programming
CO2	Structure a simple Python program for solving problems.
CO3	Apply the knowledge to decompose a Python program into functions
CO4	Analyse and Represent compound data using Python lists, tuples, dictionaries.

CO5	Read and write data form/to files in Python Program.
Year / SEM: 2ndyear / 3rd sem	**Year of Study: 2023-24**
Course Name: – EXPLORATORY DATA ANALYSIS FOR BUSINESS – 22MBABA304	
CO1	Understand Data Mining and its importance
CO2	Apply knowledge of research design for business problems
CO3	Analyze the cause-and-effect relationship between the variables from the analysis
CO4	Evaluate Regression and decision tree-based methods to solve business problems
Year / SEM: 2ndyear / 4th sem	**Year of Study : 2023-24**
Course Name: – International Business -22MBA401	
CO1	Defining international business and describe how it differs from domestic business with respect to laws, regulations and taxation.
CO2	Identify and describe factors and forces that affect an organization's decision to internationalize its business.
CO3	Describe and compare strategies for internationalization
CO4	Identify and analyze challenges in working, communicating and negotiating in a cross-cultural context.
CO5	Discuss the role of corporate social responsibility (CSR) in international business practice.
Year / SEM: 2ndyear / 4th sem	**Year of Study : 2023-24**
Course Name:– INNOVATION AND DESIGN THINKING -22MBA402	
CO1	Understand the Design Thinking process from business management perspective.
CO2	Apply the knowledge and skills of DT in prototype development for product/service innovations.
CO3	Analyse sustainable and societal challenges and find solutions
CO4	Evaluate the pros and cons for sustainable development by applying DT

Year / SEM: 2ndyear / 4th sem	**Year of Study: 2023-24**
Course Name:– Global Financial Management 22MBAFM404	
CO1	The student will have an understanding of the International Financial Environment.
CO2	The student will learn about the foreign exchange market, participants and transactions.
CO3	The student will be able to use derivatives in foreign exchange risk management.
CO4	The student will be able to evaluate the Firm's Exposure to risk in International environment and various theories associated with it.
Year / SEM: 2ndyear / 4th sem	**Year of Study: 2023-24**
Course Name: –MERGERS ACQUISTIONS AND CORPORATE RESTRUCTURING - 22MBAFM404	
CO1	To explain the major forms and objectives of corporate restructuring
CO2	To describe the process of value creation under different forms of M & A
CO3	To Understand M&A with its different classifications, strategies, theories, synergy etc.
CO4	To Conduct financial evaluation of M&A
CO5	To Analyze and demonstrate the accounting aspects of Amalgamation
CO6	To Critically evaluate different types of M&A, takeover and anti-takeover strategies
Year / SEM: 2ndyear / 4th sem	**Year of Study : 2023-24**
Course Name:– STRATEGIC BRAND MANAGEMENT- 22MBAMM403	
CO1	Comprehend & correlate all the management functions to brand creation
CO2	Ability to develop the branding strategies

CO3	Demonstrate their acumen in applying managerial and behavioural concepts in creating brand equity
CO4	Ability to analyse the global brands and their SWOT.
Year / SEM: 2ndyear / 4th sem	**Year of Study: 2023-24**
Course Name:– INTEGRATED MARKETING COMMUNICATIONS - 22MBAMM404	
CO1	The students will be able to define and apply knowledge of various aspects of managerial decision making related to marketing communications strategy and tactics.
CO2	The students will be getting an idea to explain the role of IMC in the overall marketing &Use effectiveness measures to evaluate IMC strategies.
CO3	The students will get the ability to create an integrated marketing communications plan which includes promotional strategies
CO4	The students will get trained in the art of drafting, prepare advertising copy and design other basic IMC tools ethically Situations.
Year / SEM: 2ndyear / 4th Sem	**Year of Study : 2023-24**
Course Name:– CONFLICT & NEGOTIATION MANAGEMENT - 22MBAHR403	
CO1	Understand the concepts of conflict and negotiation and its role
CO2	Learn various contemporary methods of conflict and negotiation.
CO3	Gain insights of various conflict handling mechanisms
CO4	Demonstrate the cross-cultural and gender dimensions of negotiation
Year / SEM: 2ndyear / 4th Sem	**Year of Study: 2023-24**
Course Name: Global HRM– 22MBAHR404	
CO1	Understand various practices within the field of global HRM.
CO2	Describe HR concepts, policies and practices to deal with issues in an international context.
CO3	Appraise the impact of global factors in shaping HR practices.
CO4	Apply the concepts of HR in global perspective.
Year / SEM: 2ndyear / 4th Sem	**Year of Study: 2023-24**
Course Name:– Machine learning - 22MBABA403	
CO1	Understand the concepts of Machine learning
CO2	Apply the knowledge of Data visualisation and accurate decision making
CO3	Analyse the Big data and pattern using machine learning algorithms
CO4	Evaluate the Data Structure and provide immersive experience to users
Year / SEM: 2ndyear / 4th sem	**Year of Study: 2023-24**
Course Name:– HR Analytics -22MBABA404	
CO1	Have an understanding of How HR function adds value and demonstrates the value in business terms
CO2	Measure the value of Intangibles that HR helps builds for the organization given a particular business context to facilitate decision making.
CO3	Convert soft factors in a people management context into measurable variables across various domains.
CO4	Devise, conduct and analyse a study on employees or any other related to the HR context in an organization.

PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES OF ALL DEPARTMENTS– 2023-24

(CRITERIA- 2)

Department of Robotics & Automation Engineering

2.6.1 Program outcomes, program specific outcomes and course outcomes

Program Outcomes:

Program Outcomes (POs):
At the end of this engineering program, students are expected to have developed the following outcomes:
PO1: Engineering Knowledge: Apply mathematical, physics, chemistry, scientific, and engineering fundamentals, along with specialized knowledge, to solve complex engineering problems.
PO2: Problem Analysis: Identify, formulate, and analyse intricate engineering problems, utilizing relevant research literature and fundamental principles of mathematics, natural sciences, electrical, electronics, computer science and engineering
PO3: Solution Design/Development: Design solutions and system components or processes that meet specified requirements, considering public health and safety, as well as cultural, societal, and environmental factors
PO4: Conduct Investigations: Employ research-based knowledge and methodologies, including experimental design, data analysis, and synthesis, to investigate complex engineering problems and draw valid conclusions
PO5: Modern Tool Usage: Utilize appropriate techniques, resources, and modern engineering and IT tools, including simulation, programming, automation, modeling and prediction, to carry out complex engineering activities, while understanding their limitations.
PO6: Engineering and Society: Evaluate societal, health, safety, legal, and cultural issues associated with engineering practice, making informed decisions based on contextual knowledge and assuming related professional responsibilities.

PO7: Environment and Sustainability: Recognize the impact of engineering solutions on society and the environment, and possess knowledge of and commitment to sustainable development.
PO8: Ethics: Apply ethical principles, uphold professional ethics and responsibilities, and adhere to engineering norms.
PO9: Individual and Teamwork: Function effectively both as an individual and as a member or leader in diverse teams and multidisciplinary settings.
PO10: Communication: Effectively communicate complex engineering concepts and activities to the engineering community and the wider society, including the ability to comprehend and produce reports, design documentation, presentations, and clear instructions.
PO11: Project Management and Finance: Apply engineering and management principles in project management, working as a team member or leader in multidisciplinary environments.
PO12: Lifelong Learning: Recognize the importance of and possess the skills and motivation for independent and continuous learning in the face of technological advancements and changing contexts

PROGRAM SPECIFIC OUTCOMES (PSOs):	
Engineering Graduates will be able to:	
PSO-1:	Develop Robotics and Automation systems that align with evolving industry demands, ensuring graduates are prepared to meet current and future industry requirements.
PSO-2:	Apply automation systems effectively in various domains such as manufacturing, healthcare, industrial engineering, and safety, addressing specific needs and enhancing efficiency and safety in these areas.

Course outcomes (COs)		
Year / SEM: 1st year / 1st sem		**Year of Study: 2023-24**
Course Name: – Mathematics-I for Mechanical Engineering Stream-BMATM101		
CO1	Apply the knowledge of calculus to solve problems related to polar curves.	
CO2	Learn the notion of partial differentiation to compute rate of change of multivariate functions.	
CO3	Analyse the solution of linear and non-linear ordinary differential equations.	
CO4	Make use of matrix theory for solving the system of linear equations and compute eigenvalues and eigenvectors.	
CO5	Familiarize with modern mathematical tools namely MATHEMATICA/ MATLAB/ PYTHON/SCILAB	
Year / SEM: 1st year / 1st sem		**Year of Study: 2023-24**
Course Name: – Applied Chemistry for Mechanical Engineering stream-BCHEM102		
CO1	Identify the terms and applications processes involved in scientific and engineering	
CO2	Explain the phenomena of chemistry to describe the methods of engineering processes	
CO3	Solve the problems in chemistry that are pertinent in engineering applications	
CO4	Apply the basic concepts of chemistry to explain the chemical properties and processes	
CO5	Analyse properties processes associated with chemical substances in and multi-disciplinary situations	
Year / SEM: 1st year / 1st sem		**Year of Study: 2023-24**
Course Name: – Computer Aided Engineering Drawing-BCEDK103		
CO1	Draw and communicate the objects with definite shape and dimensions	

CO2	Recognize and Draw the shape and size of objects through different views
CO3	Develop the lateral surfaces of the object
CO4	Create a Drawing views using CAD software.
CO5	Identify the interdisciplinary engineering components or systems through its graphical representation.
Year / SEM: 1st year / 1st sem	**Year of Study: 2023-24**
Course Name: - Communicative English-BENGK106	
CO1	Understand and apply the Fundamentals of Communication Skills in their communication skills
CO2	Identify the nuances of phonetics, intonation and enhance pronunciation skills.
CO3	To impart basic English grammar and essentials of language skills as per present requirement.
CO4	Understand and use all types of English vocabulary and language proficiency.
CO5	Adopt the Techniques of Information Transfer through presentation.
Year / SEM: 1st year / 1st sem	**Year of Study: 2023-24**
Course Name: – Scientific Foundations of Health-BSFHK158	
CO1	To understand and analyse about Health and wellness (and its Beliefs) & It's balance for positive mindset.
CO2	Develop the healthy lifestyles for good health for their better future.
CO3	Build a Healthy and caring relationships to meet the requirements of good/social/positive life.
CO4	To learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future
CO5	Prevent and fight against harmful diseases for good health through positive mindset.
Year / SEM: 1st year / 1ST Sem	**Year of Study: 2023-24**
Course Name: – Waste Management-BETCK105F	
CO1	Apply the basics of solid waste management towards sustainable development
CO2	Apply technologies to process waste and dispose the same.
CO3	Design working models to convert waste to energy
CO4	Identify and classify hazardous waste and manage the hazard

Year / SEM: 2nd year / 3rd sem	**Year of Study: 2023-24**
Course Name: – Fundamentals of Robotics and Applications -BRA301	
CO1	Understand the significance, social impact and future prospects of robotics and automation in various engineering applications
CO2	Identify and describe the components and anatomy of robotic system.
CO3	Know about various path planning techniques and analyse different motions of robotics system
CO4	Use the suitable drives and end-effectors for a given robotics application
CO5	Apply robotics concept to automate the monotonous and hazardous tasks and categorize various types of robots based on the design and applications in real world scenarios
Year / SEM: 2nd year / 3rd sem	**Year of Study: 2023-24**
Course Name: – Fabrication Methods of Robotic Components-BRA302	
CO1	Understand various fabrication methods and their applications in the robotics field.
CO2	Understand the material behavior and analyze its usages for different robotic components based on their properties
CO3	Apply traditional manufacturing processes to fabricate robotic components accurately

CO4	Adopt additive manufacturing techniques for rapid prototyping and production of robotic components
CO5	Demonstrate proficiency in CNC programming and machining operations to create precise robotic components
Year / SEM: 2nd year / 3rd sem	**Year of Study: 2023-24**
Course Name:– Analog and Digital Electronic Circuits -BRA303	
CO1	Understand analyse clippers, clampers, amplifier and D/A and A/D converter circuits
CO2	Explain opamp basics and Analyse OPAMP applications
CO3	Explain the concept of combinational and sequential logic circuits.
CO4	Design the combinational logic circuits.
CO5	Design the sequential circuits using SR, JK, D, T flip-flops
Year / SEM: 2nd year / 3rd sem	**Year of Study: 2023-24**
Course Name:– Mechanics of Solids and Fluids -BRA304	
CO1	Provide the basic concepts and principles of mechanics of materials
CO2	Calculate stresses and deformations of objects under external loadings
CO3	Apply the knowledge of mechanics of materials applications and design problems.
Year / SEM: 2nd year / 3rd sem	**Year of Study: 2023-24**
Course Name: – Introduction to Modeling & Design for Manufacturing BMEL305	
CO1	Create & modify form based design
CO2	Use design tools for moulded parts
CO3	Demonstrate proficiency in the setup & creation of a design
CO4	Simulate the assembly of machine components in 3D environment.
CO5	
Year / SEM: 2nd year / 3rd sem	**Year of Study : 2023-24**
Course Name: – Basic Communication Systems- BRA306A	
CO1	Analyse digital and Analog communication circuits
CO2	Compare the various AM and FM modulation techniques and analyze the related degree of modulation factors, bandwidth, etc., given the voltage/frequency amplitudes of the carrier signals and the intelligence signals
CO3	Apply pulse code modulation techniques to a given analog signal.
CO4	Examine how analog-to-digital and digital-to-analog converters are used in a give communication system
Year / SEM: 2nd year / 3rd Sem	**Year of Study: 2023-24**
Course Name: – Introduction to C++ - BRA358D	
CO1	Able to understand and design the solution to a problem using object-oriented programming concepts.
CO2	Able to reuse the code with extensible Class types, User-defined operators and function overloading
CO3	Achieve code reusability and extensibility by means of Inheritance and Polymorphism
CO4	Implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems
Year / SEM: 2nd year / 3rd Sem	**Year of Study: 2023-24**
Course Name: – Social Connect and Responsibility -BSCK307	
CO1	Communicate and connect to the surrounding
CO2	Create a responsible connection with the society.

CO3	Involve in the community in general in which they work
CO4	Notice the needs and problems of the community and involve them in problem –solving.
CO5	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems mobilizing community participation to acquire leadership qualities , democratic, attitudes and competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation

Year / SEM: 3rd year / 5th sem	**Year of Study: 2023-24**
Course Name: – DESIGN OF AUTOMATION SYSTEM- 21RA51	
CO1	Knowledge of industrial automation by transfer lines and automated assembly lines
CO2	Ability to design an automated system
CO3	Understanding of automated controls using pneumatic and hydraulic systems
CO4	Ability to understand the electronic control systems in metal machining and other manufacturing processes.
CO5	To understand advancement in hydraulics and pneumatics systems.
Year / SEM: 3rd year / 5th Sem	**Year of Study : 2023-24**
Course Name: – Hydraulics and Pneumatics- 21RA52	
CO1	Identify and analyse the functional requirements of a fluid power transmission system for a given application
CO2	Visualize how a hydraulic/pneumatic circuit will work to accomplish the function
CO3	Design an appropriate hydraulic or pneumatic circuit or combination circuit like electro-hydraulics, electro- pneumatics for a given application
CO4	Select and size the different components of the circuit.
Year / SEM: 3rd year / 5th sem	**Year of Study : 2023-24**
Course Name:– AUTONOMOUS ROBOTS- 21RA53	
CO1	Demonstrate the sensing, perception, and cognition of autonomous robots
CO2	Understand anatomy of autonomous robots
CO3	Understand operation of Humanoid robot
CO4	Understand principles of operation of telecheric robots
Year / SEM: 3rd year / 5th Sem	**Year of Study: 2023-24**
Course Name: – ROBOT OPERATING SYSTEM- 21RA54	
CO1	Discuss the basic concepts of operating system and distRIbuted system
CO2	Explain RTOS task scheduling, task synchronization and task communication mechanisms.
CO3	Install Linux for specified configuration, develop Linux C programs and implement Linux file system.
Year / SEM: 3rd year / 5th Sem	**Year of Study : 2023-24**
Course Name: – Deep Learning for Computer Vision- 21RA582	
CO1	Develop intelligent software to automate routine labor, understand speech or images, make diagnoses in medicine and support basic scientific research
CO2	Solving the tasks that are easy for people to perform but hard for people to describe formally.
CO3	Apply deep learning models for retrieval of information and machine translation.
CO4	Develop an artificial Intelligence system for the deep neural network-based applications

CO5	Evaluation of various algorithms using deep learning.
CO6	Design of intelligent model using algorithms of deep learning
Year / SEM: 3rd / 5th sem	**Year of Study: 2023-24**
Course Name: – Environmental Studies-21CIV57	
CO1	Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale
CO2	Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
CO3	Demonstrate ecology knowledge of a complex relationship between biotic and a biotic component
CO4	Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues
Year / SEM: 3rd year / 5th sem	**Year of Study: 2023-24**
Course Name: – Research methodology & intellectual property rights - 21RMI56	
CO1	To know the meaning of engineering research
CO2	To know the procedure of Literature Review and Technical Reading
CO3	To know the fundamentals of patent laws and drafting procedure.
CO4	Understanding the copyright laws and subject matters of copyrights and designs
CO5	Understanding the basic principles of design rights.

Year / SEM: 1st year / 2nd sem	**Year of Study: 2023-24**
Course Name: – Mathematics-ii for mechanical engg stream-BMATM201	
CO1	Apply the knowledge of multiple integrals to compute area and volume.
CO2	Understand the applications of vector calculus refer to solenoidal, irrotational vectors, line integral and surface integral
CO3	Demonstrate partial differential equations and their solutions for physical interpretations
CO4	Apply the knowledge of numerical methods in solving physical and engineering phenomena
CO5	Get familiarize with modern mathematical tools namely Mathematical / MATLAB /Python/ Scilab
Year / SEM: 1st yr/ 2nd sem	**Year of Study: 2023-24**
Course Name: – Applied physics for ME streams-BPHYM102/202	
CO1	Elucidate the concepts in oscillations, waves, elasticity and material failures
CO2	Discuss the fundamentals of Thermoelectric materials and their application
CO3	Summarize the low temperature phenomena and generation of low temperature
CO4	Explain the various material characterization techniques
CO5	Practice working in groups to conduct experiments in physics and perform precise and honest measurements
Year / SEM: 1st year / 2nd sem	**Year of Study : 2023-24**
Course Name: – **Elements of mechanical engineering**-BEMEM103/203	

CO1	Explain the role of mechanical engineering in industry and society, fundamentals of steam and non-conventional energy sources
CO2	Describe different conventional and advanced machining processes, IC engines, propulsive devices, air-conditioning, refrigeration
CO3	Explain different gear drives, gear trains, aspects of future mobility and fundamentals of robotics
CO4	Determine the condition of steam and its energy, performance parameters of IC engines, velocity ratio and power transmitted through power transmission systems.
Year / SEM: 1st year / 2nd sem	**Year of Study: 2023-24**
Course Name:– Professional Writing Skills in English-BPWSK206-106	
CO1	To understand and identify the Common Errors in Writing and Speaking
CO2	To Achieve better technical writing and Presentation skills
CO3	To read technical proposals properly and make them to Write good technical reports
CO4	Acquire Employment and Workplace communication skills.
CO5	To learn about Techniques of Information Transfer through presentation in different level.
Year / SEM: 1st year / 2nd sem	**Year of Study: 2023-24**
Course Name: – Indian Constitution- BICOK207	
CO1	Analyse the basic structure of Indian Constitution.
CO2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
CO3	know about our Union Government, political structure & codes, procedures.
CO4	Understand our State Executive & Elections system of India.
CO5	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.
Year / SEM: 1st year / 2nd sem	**Year of Study: 2023-24**
Course Name: – Innovation and design thinking- BIDTK158/258	
CO1	Appreciate various design process procedure.
CO2	Generate and develop design ideas through different technique.
CO3	Identify the significance of reverse Engineering to Understand products.
CO4	Draw technical drawing for design ideas.
Year / SEM: 1st year / 2nd sem	**Year of Study : 2023-24**
Course Name: – Introduction to C++ Programming	
CO1	Able to understand and design the solution to a problem using object-oriented programming concepts
CO2	Able to reuse the code with extensible Class types, User-defined operators and function Overloading.
CO3	Achieve code reusability and extensibility by means of Inheritance and Polymorphism
CO4	Implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems
Year / SEM: 1st year / 2nd sem	**Year of Study: 2023-24**
Course Name: – Introduction to C Programming	
CO1	Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts
CO2	Apply programming constructs of C language to solve the real-world problem.
CO3	Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting

CO4	Explore user-defined data structures like structures, unions and pointers in implementing solutions
CO5	Design and Develop Solutions to problems using modular programming constructs using functions
Year / SEM: 2nd year / 4th sem	**Year of Study: 2023-24**
Course Name: –Measurement Systems- BRA401	
CO1	Understand the objectives of metrology, methods of measurement, standards of measurement & various measurement parameters
CO2	Explain tolerance, limits of size, fits, geometric and position tolerances, gauges and their design
CO3	Explain measurement systems, transducers, intermediate modifying devices and terminating devices
CO4	Understand basics of control system
CO5	Ability to perform stability analysis of a control system.
Year / SEM: 2nd year / 4th sem	**Year of Study: 2023-24**
Course Name: - Microcontrollers- BRA402	
CO1	Explain the difference between Microprocessors & Microcontrollers, Architecture of 8051 Microcontroller, Interfacing of 8051 to external memory and Instruction set of 8051.
CO2	Write 8051 Assembly level programs using 8051 instructions set.
CO3	Explain the Interrupt system, operation of Timers/Counters and Serial port of 8051
CO4	Write 8051 Assembly language program to generate timings and waveforms using 8051 timers, to send & receive serial data using 8051 serial port and to generate an external interrupt using a switch
CO5	Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051 using 8051 I/O ports.
Year / SEM: 2nd year / 4th sem	**Year of Study: 2023-24**
Course Name: -Robot Kinematics, Dynamics and Control - BRA403	
CO1	To identify and enumerate different link-based mechanisms with basic understanding of motion
CO2	To understand and illustrate various power transmission mechanisms using suitable 20 methods.
CO3	To understand and illustrate various Governing mechanisms using suitable methods.
CO4	To design and evaluate the performance of different cams and followers.
Year / SEM: 2nd year / 4th sem	**Year of Study: 2023-24**
Course Name: - Robot Programming & Simulation Lab- BRAL404	
CO1	Use of any robotic simulation software to model the different types of robots and calculate work volume for different robots.
Year / SEM: 2nd year / 4th sem	**Year of Study: 2023-24**
Course Name: - Sensors and Actuators- BRA405C	
CO1	Comprehend, classify and analyse the behaviour of different types of sensors
CO2	Analyse the characteristics and performance measures of sensors and select suitable sensor for the given industrial applications.
CO3	Gain the knowledge about the types of actuators: electrical, pneumatic, and hydraulic, performance criteria and selection
CO4	Elucidate the construction and working of various industrial parameters / devices used to measure temperature, pressure, flow, level and displacement
CO5	Implement the data acquisition systems with different sensors for real-time applications
CO6	Conduct experiments and measurements in laboratory and realize hands-on experience on real components, sensors and actuators
Year / SEM: 2nd year / 4th sem	**Year of Study: 2023-24**
Course Name: - Introduction to AI&ML-BRA456A	
CO1	Evaluate Artificial Intelligence (AI) methods and describe their foundations

CO2	Apply basic principles of AI in solutions that require problem-solving, inference, perception, knowledge representation, and learning
CO3	Demonstrate knowledge of reasoning and knowledge representation for solving real-world Problems.
CO4	Analyse and illustrate how search algorithms play vital role in problem solving
CO5	illustrate the construction of learning and expert system
CO6	Discuss the current scope and limitations of AI and societal implications.
Year / SEM: 3rd year / 6th sem	**Year of Study: 2023-24**
Course Name: - Quality Control Process and Maintenance Management-21RA61	
CO1	The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.
CO2	Maintain the industry without any risk in its operation
CO3	Improve the production.
CO4	Analyse the hazards in maintenance and to solve it.
Year / SEM: 3rd year / 6th sem	**Year of Study: 2023-24**
Course Name: -PLC AND SCADA -21RA62	
CO1	Describe working of various blocks of basic industrial automation system
CO2	Connect the peripherals with the PLC
CO3	Use various PLC functions and develop small PLC programs
CO4	Summarize Distributed control system and SCADA system.
CO5	Use various industrial motor drives for the Industrial Automation.
Year / SEM: 3rd year / 6th sem	**Year of Study: 2023-24**
Course Name: -Industry 4.0 and IOT- 21RA63	
CO1	Understand the drivers and enablers of Industry 4.0
CO2	Appreciate the smartness in Smart Factories, Smart cities, smart products and smart services
CO3	Outline the various systems used in a manufacturing plant and their role in an Industry 4.0 world
CO4	Appreciate the power of Cloud Computing in a networked economy
CO5	Understand the opportunities, challenges brought about by Industry 4.0 and how organisations and individuals should prepare to reap the benefits
Year / SEM: 3rd year / 6th sem	**Year of Study: 2023-24**
Course Name: -Automation in Manufacturing- 21RA644	
CO1	Illustrate the basic concepts of automation in machine tools.
CO2	Analyse various automated flow lines, Explain assembly systems and line balancing methods
CO3	Describe the importance of automated material handling and storage systems
CO4	Interpret the importance of adaptive control systems, automated inspection systems.
Year / SEM: 3rd year / 6th sem	**Year of Study: 2023-24**
Course Name: -Electronic Circuits with Verilog- 21EC654	
CO1	Under the Verilog HDL design flow.
CO2	Describe the basic concepts of Verilog HDL programming.
CO3	Design of digital electronics circuits using dataflow, behavioural, gate-level, and structural modelling
CO4	Design complex digital circuits using advanced Verilog concepts.
Year / SEM: 3rd year / 6th sem	**Year of Study: 2023-24**
Course Name: -finite element analysis lab-21RAL66	
CO1	Identify the application and characteristics of FEA elements such as bars, beams, plane and isoperimetric elements

CO2	Develop element characteristic equation and generation of global equation.
CO3	Formulate and solve Axi-symmetric and heat transfer problems.
CO4	Apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, axi-symmetric and dynamic problems.
Year / SEM: 3rd year / 6th sem	**Year of Study: 2023-24**
Course Name: -finite element analysis lab-21RAL66	
CO1	Identify the application and characteristics of FEA elements such as bars, beams, plane and isoperimetric elements
CO2	Develop element characteristic equation and generation of global equation.
CO3	Formulate and solve Axi-symmetric and heat transfer problems.
CO4	Apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, axi-symmetric and dynamic problems.