2.6.1 Support (The institution assesses the learning levels of the students)

Principal

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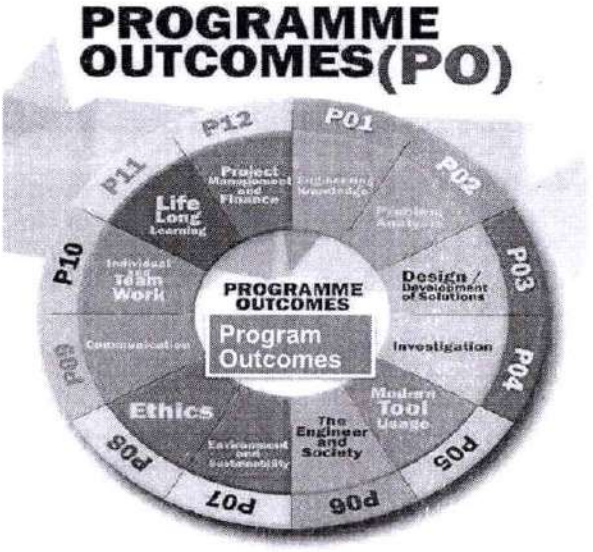
PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES OF ALL DEPARTMENTS– 2024-25

(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.

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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: 2024-25**
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.	
CO6	Apply the ANOVA test related to engineering problems	
Year / SEM: 2nd Year / 3rd Sem		**Year of Study: 2024-25**
Course Name: –DIGITAL DESIGN AND 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: 2nd Year / 3rd Sem		**Year of Study: 2024-25**
Course Name: – OPERATING SYSTEMS -BCS303		
CO1	Explain the structure and functionality of an operating system	

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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
C05	Explain file and secondary storage management strategies.
C06	Describe the need for information protection mechanisms

Year / SEM: 2nd Year / 3rd Sem	Year of Study: 2024-25
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: 2nd Year / 3rd Sem	Year of Study: 2024-25
Course Name: – DATA STRUCTURES LABORATORY-BCSL305	
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.
C05	Explain the advanced Data Structures concepts such as Hashing Techniques and Optimal Binary Search Trees

Year / SEM: 2nd Year / 3rd Sem	Year of Study: 2024-25
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, autoboxing and enumerations in program development

Year / SEM: 2nd Year / 3rd Sem	Year of Study: 2024-25
Course Name: –SOCIAL CONNECT & 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.
CO6	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

Year / SEM: 3rd Year / 5th Sem	Year of Study: 2024-25
Course Name: – SOFTWARE ENGINEERING & PROJECT MANAGEMENT - BCS501	
CO1	Differentiate process models to judge which process model has to be adopted for the given Scenarios.
CO2	Derive both functional and non-functional requirements from the case study.
CO3	Analyze the importance of various software testing methods and agile methodology.

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CO4	Illustrate the role of project planning and quality management in software development.
CO5	Identify appropriate techniques to enhance software quality.
Year / SEM: 3rd Year / 5th Sem	**Year of Study: 2024-25**
Course Name: – COMPUTER NETWORKS - BCS502	
CO1	Explain the fundamentals of computer networks.
CO2	Apply the concepts of computer networks to demonstrate the working of various layers and protocols in a communication network.
CO3	Analyze the principles of protocol layering in modern communication systems.
CO4	Demonstrate various Routing protocols and their services using tools such as Cisco Packet Tracer.
Year / SEM: 3rd Year / 5th Sem	**Year of Study: 2024-25**
Course Name: – THEORY OF COMPUTATION - BCS503	
CO1	Apply the fundamentals of automata theory to write DFA, NFA, Epsilon-NFA, and conversion between them.
CO2	Prove the properties of regular languages using regular expressions.
CO3	Design context-free grammars (CFGs) and pushdown automata (PDAs) for formal languages.
CO4	Design Turing machines to solve the computational problems.
CO5	Explain the concepts of decidability and undecidability.
Year / SEM: 3rd Year / 5th Sem	**Year of Study: 2024-25**
Course Name: – Data Visualization Lab - BAIL504	
CO1	Design the experiment to create basic charts and graphs using Tableau and Power BI.
CO2	Develop the solution for the given real-world problem.
CO3	Analyze the results and produce substantial written documentation.
Year / SEM: 3rd Year / 5th Sem	**Year of Study: 2024-25**
Course Name: – DISTRIBUTED SYSTEMS - BCS515D	
CO1	Identify the goals and challenges of distributed systems
CO2	Demonstrate the remote invocation techniques for communication
CO3	Describe the architecture of distributed file systems and name services
CO4	Apply clock synchronization algorithms to monitor and order the events.
CO5	Analyze the performance of mutual exclusion, election and consensus algorithms.
CO6	Illustrate the fundamental concepts and algorithms related to distributed transactions and replication
Year / SEM: 3rd Year / 5th Sem	**Year of Study: 2024-25**
Course Name: – COMPUTER NETWORKS LAB - BCS502	
CO1	Explain the fundamentals of computer networks.
CO2	Apply the concepts of computer networks to demonstrate the working of various layers and protocols in communication network.
CO3	Analyze the principles of protocol layering in modern communication systems.
CO4	Demonstrate various Routing protocols and their services using tools such as Cisco Packet Tracer.
Year / SEM: 3rd Year / 5th Sem	**Year of Study: 2024-25**
Course Name: – RESEARCH METHODOLOGY & IPR - BRMK557	
CO1	To know the meaning of engineering research.
CO2	To know the procedure of the literature Review and Technical Reading.
CO3	To understand the fundamentals of the patent laws and drafting procedures.
CO4	Understanding the copyright laws and subject matters of copyrights and designs.

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CO5	Understanding the basic principles of design rights.
Year / SEM: 3rd Year / 5th Sem	Year of Study: 2024-25
Course Name: – ENVIRONMENTAL STUDIES AND E-WASTE MANAGEMENT - BCS508	
CO1	Comprehend the principles of ecology and environmental issues pertaining to air, land, and water on a global scale.
CO2	Acquire observation skills for solving problems related to the environment.
CO3	Conduct a survey to describe the realities of waste management system.
Year / SEM: 3rd Year / 5th Sem	Year of Study: 2024-25
Course Name: – MINI PROJECT - BAI586	
CO1	Explore the real-life problems and their implementation through Tools &Techniques. 3 C,P
CO2	Expose the creative design process through the integration and application of diverse technical knowledge.
CO3	Analyze the possible solutions to meet the requirements of the problem solving
CO4	Build a solution by employing a variety of tools and technologies
CO5	Validate the designed solution to ensure its impact towards the selected problem

Course outcomes (COs)	
Year / SEM: 4th Year / 7th Sem	Year of Study: 2024-25
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: 4th Year / 7th Sem	Year of Study: 2024-25
Course Name: – CLOUD COMPUTING - 21CS72	
CO1	Understand and analyze various cloud computing platforms and service provider.
CO2	Illustrate various virtualization concepts.
CO3	Identify the architecture, infrastructure, and delivery models of cloud computing.
CO4	Understand the Security aspects of CLOUD.
CO5	Define platforms for development of cloud applications
Year / SEM: 4th Year / 7th Sem	Year of Study: 2024-25
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 non-HTML contents like CSV and PDF.

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C05	Perform jQuery-based AJAX integration to Django Apps to build responsive full stack web applications,
Year / SEM: 4th Year / 7th Sem	**Year of Study: 2024-25**
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: 4th Year / 7th Sem	**Year of Study: 2024-25**
Course Name:– Non Traditional Machining - 21ME751	
CO1	Understand the compare traditional and non-traditional machining process and recognize the need for non-traditional machining process.
CO2	Understand the constructional features, performance parameters, process characteristics, applications, advantages and limitations of USM, AJM and WJM.
CO3	Identify the need of Chemical and electro-chemical machining process along with the constructional features, process parameters, process characteristics, applications, advantages and limitations.
CO4	Understand the constructional feature of the equipment, process parameters, process characteristics, applications, advantages and limitations EDM & PAM.
C05	Understand the LBM equipment, LBM parameters, and characteristics. EBM equipment and mechanism of metal removal, applications, advantages and limitations LBM & EBM.
Year / SEM: 2nd Year / 4th Sem	**Year of Study: 2024-25**
Course Name: –ANALYSIS & DESIGN OF ALGORITHMS-BCS401	
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.
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.
Year / SEM: 2nd Year / 4th Sem	**Year of Study: 2024-25**
Course Name: –ARTIFICIAL INTELLIGENCE-BAI402	
CO1	Apply knowledge of agent architecture, searching and reasoning techniques for different applications.
CO2	Compare various Searching and Inferencing Techniques.
CO3	Develop knowledge base sentences using propositional logic and first order logic
CO4	Describe the concepts of quantifying uncertainty.
CO5	Use the concepts of Expert Systems to build applications.
Year / SEM: 2nd Year / 4th Sem	**Year of Study: 2024-25**
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.

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CO3	Apply various Structured Query Language (SQL) statements for database manipulation.
C04	Analyse various normalization forms for the given application.
C05	Develop database applications for the given real world problem.
C06	Understand the concepts related to NoSQL databases.
Year / SEM: 2nd Year / 4th Sem	**Year of Study: 2024-25**
Course Name: – ANALYSIS & DESIGN OF ALGORITHMS LAB-BCSL404	
CO1	Develop programs to solve computational problems using suitable algorithm design strategy
CO2	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.
Year / SEM: 2nd Year / 4th Sem	**Year of Study: 2024-25**
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: 2nd Year / 4th Sem	**Year of Study: 2024-25**
Course Name: –MONGO DB-BDS456B	
CO1	Make use of MongoDB commands and queries.
CO2	Illustrate the role of aggregate pipelines in extracting data.
CO3	Demonstrate optimization of queries by creating indexes.
CO4	Develop aggregate pipelines for text search in collections.
Year / SEM: 2nd Year / 4th Sem	**Year of Study: 2024-25**
Course Name: – BIOLOGY FOR ENGINEERS-BBOK407	
CO1	Elucidate the basic biological concepts via relevant industrial applications and case studies.
CO2	Evaluate the principles of design and development for exploring novel bioengineering projects.
CO3	Corroborate the concepts of biomimetics for specific requirements.
C04	Think critically towards exploring innovative biobased solutions for socially relevant problems.
Year / SEM: 2nd Year / 4th Sem	**Year of Study: 2024-25**
Course Name: – UNIVERSAL HUMAN VALUES COURES-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 relationships, 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 direction

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CO3	Calculate and prepare design rain harvesting structures.
CO4	Identify various geophysical methods, water management laws and sustainability assessment process.
Year / SEM: 3rd Year / 6th Sem	Year of Study: 2024-25
Course Name: – GENERATIVE AI-BAIL657C	
CO1	Develop the ability to explore and analyze word embeddings, perform vector arithmetic to investigate word relationships, visualize embeddings using dimensionality reduction techniques
CO2	Apply prompt engineering skills to real-world scenarios, such as information retrieval, text generation.
CO3	Utilize pre-trained Hugging Face models for real-world applications, including sentiment analysis and text summarization.
CO4	Apply different architectures used in large language models, such as transformers, and understand their advantages and limitations
Year / SEM: 3rd Year / 6th Sem	Year of Study: 2024-25
Course Name: – MACHINE LEARNING LAB - BAIL606	
CO1	Illustrate the principles of multivariate data and apply dimensionality reduction techniques
CO2	Demonstrate similarity-based learning methods and perform regression analysis
CO3	Develop decision trees for classification and regression problems, and Bayesian models for probabilistic learning.
CO4	Implement the clustering algorithms to share computing resources
Year / SEM: 3rd Year / 6th Sem	Year of Study: 2024-25
Course Name: – INDIAN KNOWLEDGE SYSTEMS - BIKS609	
CO1	Provide an overview of the concept of the Indian Knowledge System and its importance.
CO2	Appreciate the need and importance of protecting traditional knowledge.
CO3	Recognize the relevance of Traditional knowledge in different domains.
CO4	Establish the significance of Indian Knowledge systems in the contemporary world.
Year / SEM: 3rd Year / 6th Sem	Year of Study: 2024-25
Course Name: – PROJECT PHASE - 1 -BAI685	
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 form.
CO5	Demonstrate the knowledge, skills and attitudes of a professional engineer.
Year / SEM: 4th Year / 8th Sem	Year of Study: 2024-25
Course Name: – TECHNICAL SEMINAR- 21AI81	
CO1	To demonstrate the different surveys to understand the current industrial requirements.
CO2	To analyze different technical requirements and demonstrate interactive skills.
CO3	To demonstrate presentation skills.
CO4	To demonstrate analytical skills.
CO5	To examine the intensity of the interactive sessions.
Year / SEM: 4th Year / 8th Sem	Year of Study: 2024-25
Course Name: – NSS/YOGA/PE - 21NS83/21PE83/21YO83	
CO1	The importance of fitness/sports in day-to-day life
CO2	Benefits of Yoga on fitness and health
CO3	Understand the importance of his/her responsibility towards the society
CO4	Analyze the environmental and societal problems/issues and will be able to design solutions for the same

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Dept. of Artificial Intelligence & Machine Learning
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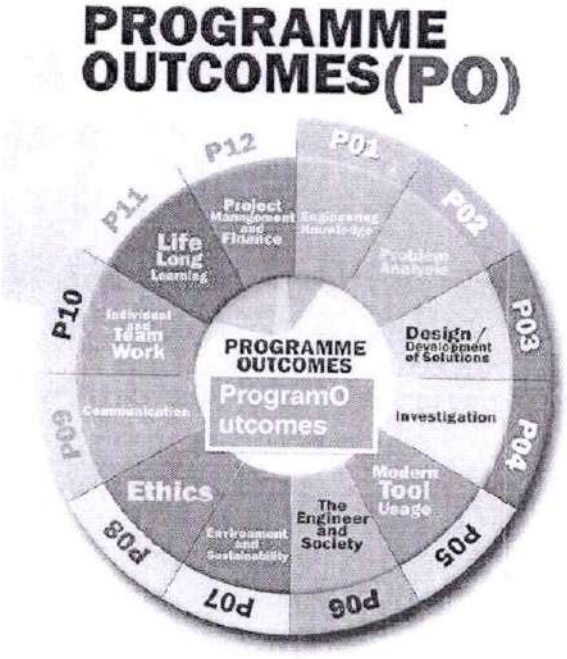
PROGRAMME OUTCOME, PROGRAMMESPECIFIC OUTCOMES AND COURSEOUTCOMES OF ALL DEPARTMENTS–

2024-25(CRITERIA-2)

Department of Civil Engineering

2.6.1 Program outcomes, program specific outcomes and course outcomes Program Outcomes:



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ProgramOutcomes(POs)
AttheendoftheB.Eprogram,studentsareexpectedtohave developedthefollowingoutcomes.
PO1-EngineeringKnowledge: Applytheknowledgeofmathematics,science,engineeringfundamentals, and an engineering specialization to the solution of complex engineering problems relatedtoCE
PO-2ProblemAnalysis: Identify,formulate,reviewliterature,andanalyzecomplexengineeringproblems related to CE and reaching substantiated conclusions using first principles of mathematics,naturalsciences, andengineering sciences
PO3-Design/Development of Solutions: Design solutions for complex engineering problems related toCEanddesignsystemcomponentsorprocessesthatmeetthespecifiedneedswithappropriateconsiderationfort hepublichealth andsafety, and thecultural, societal,andenvironmentalconsiderations
PO4-ConductInvestigationsofComplexProblems: Useresearch-basedknowledgeandresearchmethodsincludingdesignofexperiments,analysisandinterpretationofdataandsy nthesisoftheinformationtoprovidevalid conclusions
PO5-ModernToolUsage: Create,selectand applyappropriatetechniques, resources,andmodernengineeringandITtoolsincludingpredictionandmodelingtocomplexengineeringactiviti eswithand understandingofthelimitations
PO6-The Engineer and Society: Apply reasoning informed by the contextual knowledge to assesssocietal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the CEprofessionalengineering practice
PO7-EnvironmentandSustainability: UnderstandtheimpactoftheCEprofessionalengineeringsolutionsinsocietal andenvironmentalcontexts,anddemonstratetheknowledgeofandneedforsustainabledevelopment
PO8-Ethics: Apply ethicalprinciplesand committo professionalethics andresponsibilitiesandnorms oftheengineering practice
PO9-IndividualandTeamWork: Functioneffectivelyasanindividualandasamemberorleaderindiverseteams andin multidisciplinary settings
PO10-Communication: Communicateeffectivelyoncomplexengineeringactivitieswiththeengineering community and with society at large, such as, being able to comprehend and write effectivereportsanddesigndocumentation,makeeffectivepresentations,andgive and receive clearinstructions
PO11-ProjectManagementandFinance: Demonstrateknowledgeandunderstandingoftheengineering and management principles and apply these to one's own work, as a member and leader in ateam,to manageprojects andin multidisciplinaryenvironment
PO12-Life-LongLearning: Recognizetheneedfor,andhavethepreparationandabilitytoengageinindependentandlife-longlearninginthe broadest contextoftechnologicalchange

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PROGRAM SPECIFICOUTCOMES(PSOs):

Engineering Graduateswill be able to:

PSO-1:	**CompetenceinCivil Engineering:** Educatingstudentswithfundamentalmathematical,scientific, And Engineering knowledge to have a significantand positive long-term impact on the field of Civil Engineering.
PSO-2:	**Usage of CuttingEdgeTechnology:** Inspiring students and preparing them for sional careers using appropriate techniques, resources and modern attitudes mplex Engineering Activities with practical knowledge and research exposure.
PSO-3:	**Continuous improvement:** Motivatestudents inlearning tolearn and the ability to keep learning for alifetimetoincreasetheirprofessionalism,updateanddeepentheirknowledgethroughthe Developmentoftheprofession.

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Course outcomes (COs)

Year / SEM:4th year/7thsem	Year of Study:2024-25
CourseName: QUANTITY SURVEYING AND CONTRACT MANAGEMENT 21CV71	
CO1	Develop the quantity estimates for different Civil Engineering structures, works & also communicate the cost abstract in a simple form to the stake holders.
CO2	Prepare specifications of various Civil Engineering Structures/works, also will be able to analyse the requirement of a structure /work to arrive at a specific cost for completion of the same.
CO3	Make use of minimum basic knowledge gained in this course to take up entrepreneurship/employment as a contractor

Year/SEM: 4thyear/7thsem	Year of Study: 2024-25
Course Name: CONSTRUCTION TECHNOLOGY FOR SUBSTRUCTURE & SUPERSTRUCTURES 21CV72	
CO1	Select Appropriate technology for underground constructions.
CO2	Able to select appropriate pile construction method and testing of piles.
CO3	Able to select appropriate concreting practices for different constructions
CO4	.Able to select appropriate underwater construction technology

Year/SEM: 4thyear/7thsem	Year of Study: 2024-25
CourseName: REPAIR, RETROFITTING AND REHABILITATION OF STRUCTURES – 21CV736	
CO1	Identify the causes for structural (Concrete) deterioration.
CO2	Assess the type and extent of damage and carry out damage assessment of structures throughvarious types of tests.
CO3	Recommend maintenance requirements of the buildings and preventive measures againstinfluencing factors.
CO4	Select suitable material and suggest an appropriate method for repair and rehabilitation.

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Year/SEM: 4thyear/7thsem	Year of Study: 2024-25
Course Name: PAVEMENT DESIGN –21CV743	
CO1	Systematically generate and compile required data for design of pavement (Highway & Airfield).
CO2	Analyze stress, strain and deflection by boussinesq's, bur mister's and westergaard's theory.
CO3	Design rigid pavement and flexible pavement conforming to IRC58-2002 and IRC37-2001.
CO4	Evaluate the performance of the pavement and also develops maintenance statemer based on site specific requirements

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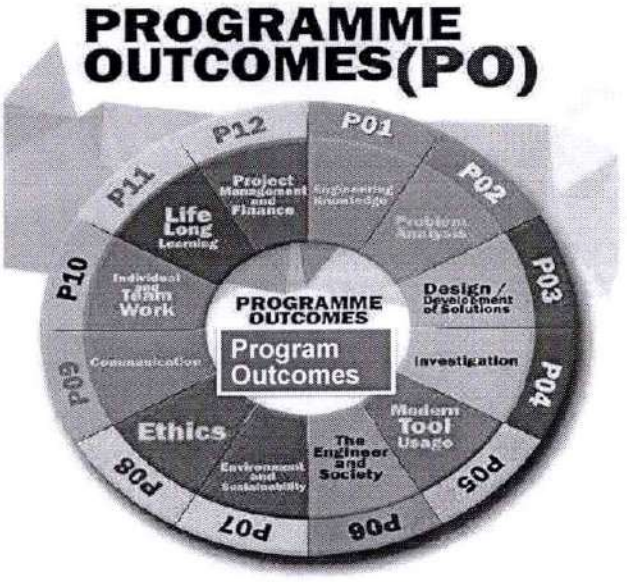
PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES OF ALL DEPARTMENTS– 2024-25

(CRITERIA- 2)

Department of Computer Science and Design

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

Professor & HOD
Department of Computer Science & Design
Rajarajeswari College of Engineering
Bangalore - 560 074.

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Kamohalli Cross, Bengaluru-74

	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)	
CSD 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: 2nd Year/3rd Sem	Year of Study:2024-2025
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.
CO6	Apply the ANOVA test related to engineering problems.

Year/Sem: 2nd Year/3rd Sem	Year of Study:2024-2025
Course Name: **Digital Design and 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:2nd Year/3rd Sem	Year of Study:2024-2025
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
CO5	Explain file and secondary storage management strategies.

Professor & HOD
Department of Computer Science & Engg.
Rajarajeswari College of Engineering
Bangalore - 560 074.

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Kamohalli Cross, Bengaluru-74

CO6	Describe the need for information protection mechanisms

Year/Sem:2nd Year/3rd Sem	Year of Study:2024-2025
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:2nd Year/3rd Sem	Year of Study:2024-2025
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, autoboxing and enumerations in program development

Year/Sem:2nd Year/3rd Sem	Year of Study:2024-2025
Course Name **OBJECT ORIENTED PROGRAMMING with C++ – (BCS306B)**	
CO1	Illustrate the basic concepts of object-oriented programming.
CO2	Design appropriate classes for the given real world scenario.
CO3	Apply the knowledge of compile-time / run-time polymorphism to solve the given problem
CO4	Use the knowledge of inheritance for developing optimized solutions
CO5	Apply the concepts of templates and exception handling for the given problem
CO6	Use the concepts of input output streams for file operations

Year/Sem: 2nd Year/3rd Sem	Year of Study:2024-2025
Course Name: **Social Connect & 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.
C06	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

Professor & HOD
Department of Computer Science & Design
Rajarajeswari College of Engineering
Bangalore - 560 074.

Principal
RAJARAJESWARI
COLLEGE OF ENGINEERING
Bangalore-74

Year/Sem: 2nd Year/3rd Sem	Year of Study:2024-2025
Course Name: **Web Application Design with HTML and PHP – (BCG358A)**	
CO1	Design tables and forms by using suitable CSS properties
CO2	Develop programs in PHP involving control structures
CO3	Develop programs to handle complex data items
CO4	Develop programs to access and manipulate the contents of files
CO5	Use visualization packages and file handlers for data analysis..

Year/Sem: 2nd Year/3rd Sem	Year of Study:2024-2025
Course Name: **R Programming – (BCS358B)**	
CO1	Explain the fundamental syntax of R data types, expressions and the usage of the R-Studio IDE
CO2	Develop a program in R with programming constructs: conditionals, looping and functions.
CO3	Apply the list and data frame structure of the R programming language.
CO4	Demonstrate the concepts of Web Scraping and Numerical Analysis
CO5	Demonstrate the concepts of data visualization

Year/Sem: 2nd Year/3rd Sem	Year of Study:2024-2025
Course Name: **Project Management with Git – (BCS358C)**	
CO1	Use the basics commands related to git repository
CO2	Create and manage the branches
CO3	Apply commands related to Collaboration and Remote Repositories
CO4	Use the commands related to Git Tags, Releases and advanced git operations
CO5	Analyse and change the git history

Year/Sem: 2nd Year/3rd Sem	Year of Study:2024-2025
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 Maps.

Year/Sem: 2nd Year/4th Sem	Year of Study:2024-2025
Course Name: **Analysis & Design of Algorithms – (BCS401)**	
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.
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.

Professor & HOD
Department of Computer Science & Design
Rajarajeswari College of Engineering
Bangalore - 560 074.

Principal
RAJARAJESWARI
COLLEGE OF ENGINEERING
Ramohalli Cross, Bangalore-74

Year/Sem: 2nd Year/4th Sem	Year of Study:2024-2025
Course Name: **COMPUTER GRAPHICS AND VISUALIZATION – (BCG402)**	
CO1	Demonstrate simple algorithms using OpenGL Graphics primitives and attributes.
CO2	Apply mathematical concepts for 2-D and 3-D geometric transformations.
CO3	Make use of OpenGL functions for Interactive Input, GUI and animations.
CO4	Explain clipping algorithms, color models and illumination models.
CO5	Demonstrate visualization of surfaces and 3D objects.

Year/Sem: 2nd Year/4th Sem	Year of Study:2024-2025
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.
CO6	Understand the concepts related to NoSQL databases.

Year/Sem: 2nd Year/4th Sem	Year of Study:2024-2025
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: 2nd Year/4th Sem	Year of Study:2024-2025
Course Name: **GRAPH THEORY – (BCS405B)**	
CO1	Explain the fundamental concepts of properties and representation of graphs.
CO2	Solve the problems involving characterization and operations on graphs.
CO3	Apply concepts of trees and graph connectivity to solve real world problems.
CO4	Apply the concepts of planar graph and graph representations to solve the given problem.
CO5	Use the concepts of matching and coloring of graphs to solve the real world problems.

Professor & HOD
Department of Computer Science & Design
Rajarajeswari College of Engineering
Bangalore - 560 074.

Principal
RAJARAJESWARI
COLLEGE OF ENGINEERING
Kambalipura Cross, Bangalore-74

Year/Sem:2nd Year/4th Sem	Year of Study:2024-2025
Course Name: **OPTIMIZATION TECHNIQUE – (BCS405C)**	
CO1	Apply the concepts of vector calculus to solve the given problem.
CO2	Apply the concepts of partial differentiation in machine learning and deep neural networks.
CO3	Analyze the convex optimization algorithms and their importance in computer science & engineering.
CO4	Apply the optimization algorithms to solve the problem.
CO5	Analyze the advanced optimization algorithms for machine learning .

Year/Sem:2nd Year/4th Sem	Year of Study:2024-2025
Course Name: **LINEAR ALGEBRA – (BCS405D)**	
CO1	Explain the concepts of vector spaces, subspaces, bases, dimension and their properties.
CO2	Use matrices and linear transformations to solve the given problem.
CO3	Compute Eigenvalues and Eigenvectors for the linear transformations
CO4	Determine orthogonality of inner product spaces.
CO5	Apply the optimization techniques to solve the problems.

Year/Sem:2nd Year/4th Sem	Year of Study:2024-2025
Course Name: **Responsive Web design with Bootstrap 5.0 – (BCGL456B)**	
CO1	Apply concepts of Bootstrap framework based layout and navigaion classes to develop Web Pages
CO2	Design Web pages to organize data and present text with features using Bootstrap framework
CO3	Develop Web User interfaces for varieties of interactions with Bootstrap framework classes
CO4	Build Web pages involving animations, popups and accordions with Bootstrap framework classes
CO5	Make use of Bootstrap framework image, alert and modal classes in developing Web pages.

Year/Sem: 2nd Year/4th Sem	Year of Study:2024-2025
Course Name: **Mobile First Web design with W3.CSS – (BCGL456C)**	
CO1	Apply concepts of W3.CSS based layout and selection classes to develop Web Pages
CO2	Design Web pages to organize data and present text with features using W3.CSS
CO3	Develop Web User interfaces for varieties of interactions with W3.CSS classes
CO4	Build Web pages involving animations and accordions with W3.CSS classes
CO5	Make use of W3.CSS image and modal classes in developing Web pages

Year/Sem: 2nd Year/4th Sem	Year of Study:2024-2025
Course Name: **Technical Writing using LaTeX – (BCSL456D)**	
CO1	Apply basic LaTeX command to develop simple document
CO2	Develop LaTeX script to present the tables and figures in the document
CO3	Illustrate LaTeX script to present theorems and mathematical equations in the document
CO4	Develop programs to generate the complete report with citations and a bibliography
CO5	Illustrate the use of Tikz and algorithm libraries to design graphics and algorithms in the document

Professor & HOD
Department of Computer Science & Design
Rajarajeswari College of Engineering
Bangalore - 560 074.

Principal
RAJARAJESWARI
COLLEGE OF ENGINEERING
Kambohalli Cross, Bengaluru-74

(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. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

Dr. D. KIRUBHA
Head of the Department,
Computer Science and Engineering,
Rajarajeswari College of Engineering
Bangalore - 560 074

Principal
RAJARAJESWARI
COLLEGE OF ENGINEERING
Kambohalli Cross, Bengaluru-74

PO8: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO9: 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.
PO10: 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.
PO11: 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 CSE graduates will have the ability to:	
PSO-1	Investigate complex problems across various domains, applying appropriate computational techniques to systematic design solutions and evaluate their effectiveness.
PSO-2	Apply software engineering principles to design and develop high-quality, innovative software systems, utilizing contemporary and emerging information processing technologies.

Academic Year: 2024-2025

B.E (CSE)

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

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

Dr. D. KIRUBHA
Head of the Department,
Computer Science and Engineering,
Rajarajeswari College of Engineering,

RAJARAJESWARI
COLLEGE OF ENGINEERING
Kamohalli Cross, Bengaluru-7

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

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

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

CO	Description
At the end of the course, the student will be able to	
CO1	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

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

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

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

Dr. D. KIRUBHA
Head of the Department,
Computer Science and Engineering,
Rajarajeswari College of Engineering,
Bangalore - 560 074.

Principal
RAJARAJESWARI
COLLEGE OF ENGINEERING
Kambohalli Cross, Bengaluru-74

CO	Description
At the end of the course, the student will be able to	
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
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	
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
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: Microcontrollers **Sub. Code: BCS402**

CO	Description
At the end of the course, the student will be able to	
CO1	Explain the ARM Architectural features and Instructions.
CO2	Develop programs using ARM instruction set for an ARM Microcontroller.
CO3	Explain C-Compiler Optimizations and portability issues in ARM Microcontroller.
CO4	Apply the concepts of Exceptions and Interrupt handling mechanisms in developing applications.
CO5	Demonstrate the role of Cache management and Firmware in Microcontrollers

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

CO	Description
At the end of the course, the student will be able to	
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
CO6	Understand the concepts related to NoSQL databases

Dr. D. KIRUBHA
Head of the Department,
Computer Science and Engineering,
Rajarajeswari College of Engineering
Bangalore - 560 074

Principal
RAJARAJESWARI
COLLEGE OF ENGINEERING
Kamohalli Cross, Bengaluru-74

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

CO	Description
At the end of the course, the student will be able to	
CO1	Develop programs to solve computational problems using suitable algorithm design strategy
CO2	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	
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

Subject name: Technical writing using LATEX Lab **Sub. Code: BCS456C**

CO	Description
At the end of the course, the student will be able to	
CO1	Apply basic LaTeX command to develop simple document
CO2	Develop LaTeX script to present the tables and figures in the document
CO3	Illustrate LaTeX script to present theorems and mathematical equations in the document
CO4	Develop programs to generate the complete report with citations and a bibliography
CO5	Illustrate the use of Tikz and algorithm libraries to design graphics and algorithms in the document

Subject name: UNIVERSAL HUMAN VALUES **Sub. Code: BUHK408**

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

D. Kiru.:

Dr. D. KIRUBHA
Head of the Department,
Computer Science and Engineering
Rajarajeswari College of Engineering
Bangalore - 560 074.

Principal
RAJARAJESWARI
COLLEGE OF ENGINEERING
Kamakshipalya Cross, Bengaluru-74

5th Semester

Subject name: Software Engineering & Project Management **Sub. Code: BCS501**

CO	Description
At the end of the course, the student will be able to	
CO1	Differentiate process models to judge which process model has to be adopted for the given scenarios.
CO2	Derive both functional and nonfunctional requirements from the case study.
CO3	Analyze the importance of various software testing methods and agile methodology.
CO4	Illustrate the role of project planning and quality management in software development.
CO5	Identify appropriate techniques to enhance software quality.

Subject name: Computers Networks **Sub. Code: BCS502**

CO	Description
At the end of the course, the student will be able to	
CO1	Explain the fundamentals of computer networks.
CO2	Apply the concepts of computer networks to demonstrate the working of various layers and protocols in communication network
CO3	Analyze the principles of protocol layering in modern communication systems.
CO4	Demonstrate various Routing protocols and their services using tools such as Cisco packet tracer.

Subject name: THEORY OF COMPUTATION **Sub. Code: BCS503**

CO	Description
At the end of the course, the student will be able to	
CO1	Apply the fundamentals of automata theory to write DFA, NFA, Epsilon-NFA and conversion between them.
CO2	Prove the properties of regular languages using regular expressions
CO3	Design context-free grammars (CFGs) and pushdown automata (PDAs) for formal languages
CO4	Design Turing machines to solve the computational problems
CO5	Explain the concepts of decidability and undesirability.

Subject name: Web Technology Lab **Sub. Code: BCSL504**

CO	Description
At the end of the course, the student will be able to	
CO1	Design the experiment for the given problem using HTML, Javascript and CSS.
CO2	Develop the solution for the given real-world problem using jQuery, Ajax and PHP.
CO3	Analyze the results and produce substantial written documentation.

Subject name: ARTIFICIAL INTELLIGENCE **Sub. Code: BCS515B**

CO	Description

Dr. D. KIRUBHA
Head of the Department,
Computer Science and Engineering
Rajarajeswari College of Engineering,
Bangalore - 560 074.

Principal
RAJARAJESWARI
COLLEGE OF ENGINEERING
Bangalore-74

At the end of the course, the student will be able to	
CO1	Explain the architecture and components of intelligent agents, including their interaction with the AI environment.
CO2	Apply problem-solving agents and various search strategies to solve a given problem
CO3	Illustrate logical reasoning and knowledge representation using propositional and first-order logic
CO4	Demonstrate proficiency in representing knowledge and solving problems using first-order logic
CO5	Describe classical planning in the context of artificial intelligence, including its goals, constraints and applications in problem-solving.

Subject name: RESEARCH METHODOLOGY & IPR **Sub. Code: BRMK557**

CO1	To know the meaning of engineering research
CO2	To know the procedure of the literature Review and Technical Reading
CO3	To understand the fundamentals of the patent laws and drafting procedures.
CO4	Understanding the copyright laws and subject matters of copyrights and designs.
CO5	Understanding the basic principles of design rights

Subject name: Environmental Studies and E-Waste Management **Sub. Code: BCS508**

CO	Description
At the end of the course, the student will be able to	
CO1	Comprehend the principles of ecology and environmental issues pertaining to air, land, and water on a global scale
CO2	Acquire observation skills for solving problems related to the environment.
CO3	Conduct survey to describe the realities of waste management system

6th Semester

Subject name: Cloud Computing (Open Stack /Google) **Sub. Code: BCS601**

CO	Description
At the end of the course, the student will be able to	
CO1	Apply Javascript to build dynamic and interactive Web projects
CO2	Implement user interface components for JavaScript-based Web using React.JS
CO3	Apply Express/Node to build web applications on the server side.
CO4	Develop data model in an open source nosql database
CO5	Demonstrate modularization and packing of the front-end modules.

Subject name: Machine Learning **Sub. Code: BCS602**

CO	Description
At the end of the course, the student will be able to	
CO1	Describe the machine learning techniques, their types and data analysis framework.
CO2	Apply mathematical concepts for feature engineering and perform dimensionality reduction to enhance model performance
CO3	Develop similarity-based learning models and regression models for solving classification and prediction tasks

Dr. D. KIRUBHA
Head of the Department,
Computer Science and Engineering,
Rajarajeswari College of Engineering,
Bangalore - 560 074

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CO4	Build probabilistic learning models and design neural network models using perceptron's and multilayer architectures
CO5	Utilize clustering algorithms to identify patterns in data and implement reinforcement learning techniques

Subject name: Compiler Design **Sub. Code: BIS613C**

CO	Description
At the end of the course, the student will be able to	
CO1	Understand the different phases of compiler design techniques
CO2	Analyze the working of lexical analyzer in design of compilers
CO3	Design syntax analyzer using top down and bottom up approaches
CO4	Illustrate syntax-directed translation for a given grammar.
CO5	Explain intermediate code representation and code generation of compilers

Subject name: Machine Learning lab **Sub. Code: BCSL606**

CO	Description
At the end of the course, the student will be able to	
CO 1	Illustrate the principles of multivariate data and apply dimensionality reduction techniques.
CO 2	Demonstrate similarity-based learning methods and perform regression analysis
CO3	Develop decision trees for classification and regression problems, and Bayesian models for probabilistic learning.
CO4	Implement the clustering algorithms to share computing resources

Subject name: SOFTWARE TESTING AUTOMATION **Sub. Code: BIS657E**

CO	Description
At the end of the course, the student will be able to	
CO1	Demonstrate Katalon Studio and Selenium architecture and key features of the Katalon Studio and Selenium automation tool.
CO2	Develop test scenarios that can be run automatically.
CO3	Develop test cases and modules in the automation tool.
CO4	Use selenium to build test Suits and run tests in different browsers.

7th SEMESTER

Subject name: Big Data Analytics **Sub. Code: 21CS71**

CO	Description
The student will be able to :	
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

Subject name: Cloud Computing **Sub. Code: 21CS72**

Dr. D. KIRUBHA
Head of the Department,
Computer Science and Engineering
Rajarajeswari College of Engineering

RAJARAJESWARI COLLEGE OF ENGINEERING
Kambipura, Mysuru Cross, Bengaluru-74

CO	Description
The student will be able to :	
CO1	Understand and analyze various cloud computing platforms and service provider
CO2	Illustrate various virtualization concepts.
CO3	Identify the architecture, infrastructure and delivery models of cloud computing
CO4	Understand the Security aspects of CLOUD
CO5	Define platforms for development of cloud applications

Subject name: Deep Learning **Sub. Code: 21CS743**

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: Internet of Things **Sub. Code: 21CS735**

CO	Description
The student will be able to :	
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.

Subject name: Environmental and Protection Management **Sub. Code: 21CV753**

CO	Description
The student will be able to :	
CO1	Appreciate the elements of Corporate Environmental Management systems complying to international environmental management system standards
CO2	Lead pollution prevention assessment team and implement waste minimization options
CO3	Develop, Implement, maintain and Audit Environmental Management systems for Organization's

Dr. D. KIRUBH...
Head of the Department,
Computer Science and Engineering
Rajarajeswari College of Engineering,
Bangalore - 560 074

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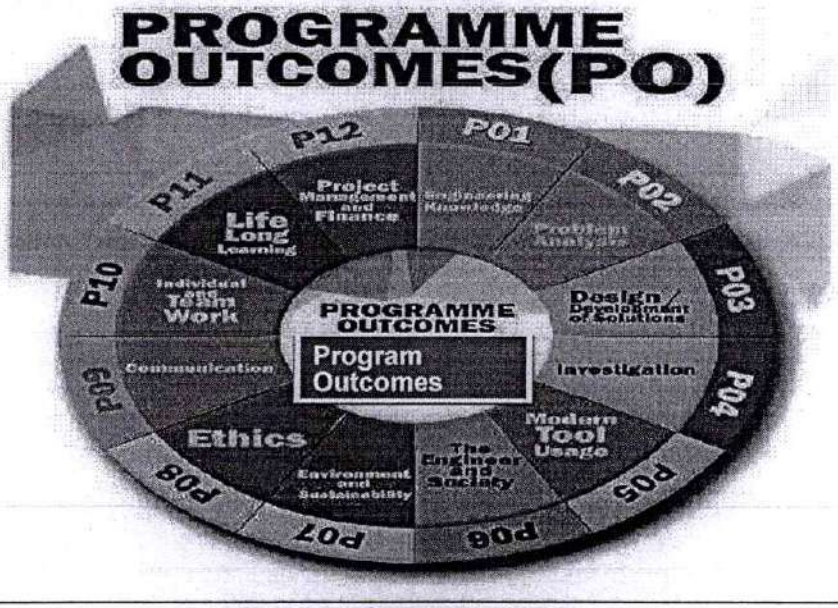
PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES OF ALL DEPARTMENTS– 2024-25

(CRITERIA- 2)

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.

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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 : 2024-25**
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 : 2024-25**
Course Name:– Digital Design & Computer Organization- BCS302	
CO1	Apply the K–Map techniques to simplify various Boolean expressions.

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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 : 2024-25**
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 : 2024-25**
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 andOptimal Binary Search Trees
Year / SEM: 2ndyear / 3rdsem	**Year of Study : 2024-25**
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 : 2024-25**
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

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	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 : 2024-25
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 : 2024-25
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 Matplot lib 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 : 2024-25
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 : 2024-25
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 : 2024-25**
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	Analyze 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 : 2024-25**
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 : 2024-25**
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 : 2024-25**
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 : 2024-25**
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 : 2024-25
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

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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 : 2024-25**
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 : 2024-25**
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

Year / SEM: 3rd year / 5th Sem	**Year of Study : 2024-25**
Course Name:– Software Engineering & Project Management	
CO1	Differentiate Process Models to judge which process model has to be adopted for the given scenarios
CO2	Derive both functional and nonfunctional requirements from the case study.
CO3	Analyze the importance of various software testing methods and agile methodology.
CO4	Illustrate the role of project planning and quality management in software development.
CO5	Identify appropriate techniques to enhance software quality.
Year / SEM: 3rd year / 5th sem	**Year of Study : 2024-25**
Course Name:– Computer Networks	
CO1	Study the TCP/IP protocol suite, switching criteria and Medium Access Control protocols for reliable and noisy channels.
CO2	Learn network layer services and IP versions.
CO3	Discuss transport layer services and understand UDP and TCP protocols.
CO4	Demonstrate the working of different concepts of networking layers and protocols.
CO5	Study the TCP/IP protocol suite, switching criteria and Medium Access Control protocols for reliable and noisy channels.

Year / SEM: 3rd year / 5th sem	**Year of Study : 2024-25**
Course Name:– Theory of Computation	
CO1	Introduce core concepts in Automata and Theory of Computation.
CO2	Identify different Formal Language Classes and their Relationships.
CO3	Learn concepts of Grammars and Recognizers for different formal languages.

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CO4	Prove or disprove theorems in automata theory using their properties.
CO5	Determine the decidability and intractability of Computational problems.

Year / SEM: 3rd year / 5th sem	Year of Study : 2024-25
Course Name:– IoT Lab	
CO1	Learn the fundamental concept of Internet of Things.
CO2	Learn the connections and working of Arduino board.

Year / SEM: 3rd year / 5th sem	Year of Study : 2024-25
Course Name:– Artificial Intelligence	
CO1	Learn the basic principles and theories underlying artificial intelligence, including machine learning, neural networks, natural language processing, and robotics.
CO2	Apply AI techniques to solve real-world problems, including search algorithms, optimization, and decision-making processes.
CO3	Understand the ethical, legal, and societal implications of AI, including topics such as bias, fairness, accountability, and the impact of AI on the workforce and privacy.
CO4	

Year / SEM: 3rd year / 5th sem	Year of Study : 2024-25
Course Name:– Research Methodology & IPR	
CO1	To Understand the knowledge on basics of research and its types.
CO2	To Learn the concept of Literature Review, Technical Reading, Attributions and Citations.
CO3	To learn Ethics in Engineering Research.
CO4	To Discuss the concepts of Intellectual Property Rights in engineering.

Year / SEM: 3rd year / 6th sem	Year of Study : 2024-25
Course Name:– Microcontrollers & Embedded Systems	
CO1	Understand the architectural features and instruction set of 32 bit ARM microcontrollers.
CO2	Apply instructions of assembly language for programming ARM
CO3	Interpret the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
CO4	Explain the need of real time operating system for embedded system applications.
	Develop/test/Conduct the experiments on an ARM7TDMI/LPC2148 evaluation board using Embedded 'C' and Keil Vision tool/Compiler

Year / SEM: 3rd year / 6th sem	Year of Study : 2024-25
Course Name:– Cryptography & Network Security	
CO1	Understand the basics of Cryptography concepts, Security and its principle
CO2	To analyse different Cryptographic Algorithms
CO3	To illustrate public and private key cryptography
CO4	To understand the key distribution scenario and certification
CO5	To understand approaches and techniques to build protection mechanism in order to secure computer networks

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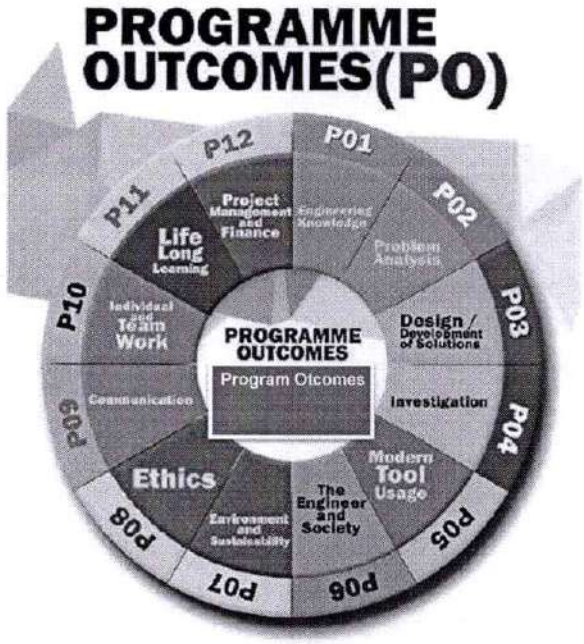
Department of Electronics Communication and Engineering

2.6.1 Program outcomes, program specific outcomes and course outcomes

Program Outcomes:



PO1 - Engineering Knowledge:

Acquire knowledge on fundamentals of Electronics & Communication Engineering, Sciences, Mathematics and Computational aspects.

PO2 - Problem Analysis:

Identify formulate and solve complex Electronics & Communication Engineering problems by choosing and applying appropriate analysis and modeling methods.

PO3 Design/Development of solutions:

Design and conduct hardware, software, simulation component or process to meet desired needs with realistic constraints including health, safety, cultural, societal and environmental considerations.

PO4 - Conduct Investigations of Complex problems:

Carry out research, experiments, team projects and publish the outcomes in various symposia, conferences and journals.

PO5 - Modern Tool Usage:

Use advanced tools like Matlab, Cadence, Xilinx, Masm, C & Embedded C, Kiel, CCS V3, V4 to solve complex electronics and interdisciplinary problems.

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PO6 - The Engineer and Society:

Demonstrate the understanding of impact of engineering solutions on the society and also will be aware of contemporary issues.

PO7 - Environment and Sustainability:

Evaluate the impact of engineering solutions in diverse engineering fields such as health, environment and safety in global and societal contexts.

PO8 - Ethics:

Demonstrate knowledge of professional and ethical responsibilities while presenting sustainable solutions.

PO9 - Individual and Team Work:

Work effectively as an individual and as a leader in interdisciplinary environments.

PO10 -Communication:

Communicate effectively in both verbal and written form.

PO11 -Project Management and Finance:

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

PO12 -Life-Long Learning:

Participate and succeed in competitive examinations, develop confidence for self-education and ability for life-long learning.

PROGRAM SPECIFIC OUTCOMES(PSOs):

Engineering Graduates will be able to:

PSO-1:	Demonstrate the Competency to analyse the real time problems related to electronics and communication industry and able to design and develop products with the cutting edge technology.
PSO-2:	Demonstrate leadership qualities to resolve the complex multidisciplinary engineering ,societal challenges in the ethical manner

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Course Outcomes:

Year / SEM : 2^{nd}year / 3^{rd}sem	Year of Study : 2024-25
Course Name: Mathematics-III for EC Engineering (BMATEC301)	
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 : 2^{nd}year / 3^{rd}sem	Year of Study : 2024-25
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 : 2^{nd}year / 3^{rd}sem	Year of Study : 2024-25
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 : 2^{nd}year / 3^{rd}sem	Year of Study : 2024-25
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.

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Year / SEM : 2nd year / 3rd sem	Year of Study : 2024-25
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 : 2024-25
Course Name: Electronic Devices (BEC 306A)	
CO1	Understand the principles of semiconductor Physics
CO2	Understand the principles and characteristics of different types of semiconductor devices
CO3	Understand the fabrication process of semiconductor devices
CO4	Utilize the mathematical models of semiconductor junctions for circuits and systems.
CO5	Identify the mathematical models of MOS transistors for circuits and systems.

Year / SEM : 2nd year / 3rd sem	Year of Study : 2024-25
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.
CO6	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes

Year / SEM : 2nd year / 3rd sem	Year of Study : 2024-25
Course Name: LABVIEW Programming (BEC358A)	
CO1	Use LabVIEW to create data acquisition, analysis and display operations
CO2	Create user interfaces with charts, graph and buttons
CO3	Use the programming structures and data types that exist in LabVIEW
CO4	Use various editing and debugging techniques.

Year / SEM : 2nd year / 4 th sem	Year of Study : 2024-25
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.

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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 : 2024-25
Course Name: PRINCIPLES OF COMMUNICATION SYSTEMS (BEC402)	
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 : 2024-25
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 Motor to 8051 using 8051 I/O ports.

Year / SEM : 2nd year / 4 th sem	Year of Study : 2024-25
Course Name: Control Systems (BEC403)	
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

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CO5	Determine the stability of a system in the frequency domain using Nyquist and bode plots.

Year / SEM : 2ndyear / 4 th sem	Year of Study : 2024-25
Course Name: Communication Laboratory (BECL404)	
CO1	Illustrate the AM generation and detection using suitable electronic circuits.
CO2	Design of FM circuits for modulation, demodulation and noise suppression.
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 : 2ndyear / 4 th sem	Year of Study : 2024-25
Course Name: Microcontrollers (BEC405A)	
CO1	Describe the difference between Microprocessor and Microcontroller, Types of Processor Architectures and Architecture of 8051Microcontroller.
CO2	Discuss the types of 8051 Microcontroller Addressing modes & Instructions with Assembly Language Programs.
CO3	Explain the programming operation of Timers/Counters and Serial port of 8051 Microcontroller.
CO4	Illustrate the Interrupt Structure of 8051 Microcontroller & its programming.
CO5	Develop C programs to interface I/O devices with 8051 Microcontroller.

Year / SEM : 2ndyear / 4 th sem	Year of Study : 2024-25
Course Name: Microcontrollers Laboratory(BEC456A)	
CO1	Write a Assembly Language / C programs in 8051 for solving simple problems that manipulate input data using different instructions.
CO2	Develop Testing and experimental procedures on 8051 Microcontroller, Analyze their operation under different cases.
CO3	Developprogramsfor8051Microcontrollertoimplementreal world problems.
CO4	DevelopMicrocontrollerapplicationsusingexternalhardwareinterface.

Year / SEM : 2ndyear / 4 th sem	Year of Study : 2024-25
Course Name: Biology for Engineers (BBOK407)	
CO1	Elucidate the basic biological concepts via relevant industrial applications and case studies.
CO2	Evaluate the principles of design and development, for exploring novel bioengineering projects.
CO3	Corroborate the concepts of biomimetics for specific requirements.
CO4	Think critically towards exploring innovative biobased solutions for socially relevant problems.

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Year / SEM : 2ndyear / 4 th sem	Year of Study : 2024-25
Course Name: Universal Human Values (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 relationships, 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 direction

Year / SEM : 3rd year / 5 th sem	Year of Study : 2024-25
Course Name: Technological Innovation and Management Entrepreneurship (BEC501)	
CO1	Understand the fundamental concepts of Management and Entrepreneurship and opportunities in order to setup a business.
CO2	Describe the functions of Managers, Entrepreneurs and their social responsibilities
CO3	Understand the components in developing a business plan, along with the integration of CSR-Corporate Social Responsibility.
CO4	Describe the importance of small scale industries in economic development and institutional support to start a small scale industry and understand the concepts of Creativity and Innovation and Identification of Business Opportunities.
CO5	Awareness about various sources of funding and institutions supporting entrepreneurs

Year / SEM : 3rd year / 5 th sem	Year of Study : 2024-25
Course Name: Digital Signal Processing (BEC502)	
CO1	Analyse the different types of signals and systems used in digital signal processing.
CO2	Compute the response of an LTI system using time and frequency domain techniques.
CO3	Develop algorithms for the efficient computations of DFT and IDFT.
CO4	Design of digital FIR filters for the given specifications using different window methods
CO5	Design of digital IIR digital filters using bilinear transformation method.

Year / SEM : 3rd year / 5 th sem	Year of Study : 2024-25
Course Name: DIGITAL COMMUNICATION (BEC503)	
CO1	Apply the concept of signal conversion to vectors in communication transmission and reception.
CO2	Perform the mathematical analysis of digital communication systems for different modulation techniques.
CO3	Apply the Source coding and Channel coding principles for the discrete memoryless channels.
CO4	Compute the codewords for the error correction and detection of a digital data using Linear Block Code, Cyclic Codes and Convolution Codes.
CO5	Design encoding and decoding circuits for Linear Block Code, Cyclic Codes and Convolution Codes.

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Year / SEM : 3rd year / 5 th sem	Year of Study : 2024-25
Course Name: Satellite and Optical Communication (BEC515D)	
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 communication satellite with the focus on national satellite system.
CO4	Classification and characterization of optical fibers with different modes of signal propagation.
CO5	Describe the constructional features and the characteristics of optical fiber and optical devices used for signal transmission and reception.

Year / SEM : 3rd year / 5 th sem	Year of Study : 2024-25
Course Name: Digital Communication Lab (BECL504)	
CO1	Design the basic digital modulation and demodulation circuits for different engineering applications.
CO2	Design of optimum communication receivers for AWGN channels.
CO3	Illustration of different digital modulations using the signals and its equivalent vector representations.
CO4	Implement the source coding and channel coding procedures using suitable software.

Year / SEM : 3rd year / 5 th sem	Year of Study : 2024-25
Course Name: Research Methodolgy and IPR (BRMK557)	
CO1	To know the meaning of engineering research
CO2	To know the procedure of the literature Review and Technical Reading
CO3	To understand the fundamentals of the patent laws and drafting procedures.
CO4	Understanding the copyright laws and subject matters of copyrights and designs.
CO5	Understanding the basic principles of design rights

Year / SEM : 3rd year / 5 th sem	Year of Study : 2024-25
Course Name: Environmental Studies (BESK508)	
CO1	Comprehend the principles of ecology and environmental issues pertaining to air, land, and water on a global scale
CO2	Acquire observation skills for solving problems related to the environment.
CO3	Conduct survey to describe the realities of waste management system

Year / SEM : 3rd year / 6 th sem	Year of Study : 2024-25
Course Name: Embedded System Design (BEC601)	
CO1	Describe the architectural features and instructions of 32-bit microcontroller ARM Cortex M3.
CO2	Apply the knowledge gained for Programming ARM Cortex M3 for different applications.

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CO3	Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
CO4	Understand the hardware software co-design and firmware design approaches.
CO5	Explain the need of real time operating system for embedded system applications.

Year / SEM : 3rd year / 6 th sem	Year of Study : 2024-25
Course Name: VLSI Design and Testing(BEC602)	
CO1	Apply the fundamentals of semiconductor physics in MOS transistors and analyze the geometrical effects of MOS transistors
CO2	Design and realize combinational, sequential digital circuits and memory cells in CMOS logic.
CO3	Analyze the synchronous timing metrics for sequential designs and structured design basics.
CO4	Understand designing digital blocks with design constraints such as propagation delay and dynamic power dissipation
CO5	Understand the concepts of Sequential circuits design and VLSI testing

Year / SEM : 3rd year / 6 th sem	Year of Study : 2024-25
Course Name: Multimedia Communication (BCE613A)	
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 : 2024-25
Course Name : Data Security (BEC613B)	
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	Explain message authentication using HASH functions, MAC functions and Digital signatures.
CO5	Explain how symmetric and asymmetric encryption algorithms can be used to distribute keys

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Year / SEM : 3rd year / 6 th sem	Year of Study : 2024-25
Course Name : Digital Image Processing (BEC613C)	
CO1	Understand image formation and the role of human visual system plays in the perception of gray and color image data.
CO2	Compute various transforms on digital images.

CO3	Conduct an independent study and analysis of Image Enhancement techniques.
CO4	Apply image processing techniques in the frequency (Fourier) domain.
CO5	Design image restoration techniques.

Year / SEM : 3rd year / 6 th sem	Year of Study : 2024-25
Course Name : Technologies of Renewable Energy Sources (BEE654B)	
CO1	Describe the environmental aspects of renewable energy compared to conventional energy sources.
CO2	Explain the working principles and components of solar energy systems, including heating, cooling, desalination, and power generation
CO3	Understand the conversion principles and applications of wind and tidal energy.
CO4	Comprehend the concept of biomass energy resources and green energy.
CO5	Acquire basic knowledge of ocean thermal energy conversion and hydrogen energy.

Year / SEM : 3rd year / 6 th sem	Year of Study : 2024-25
Course Name : VLSI Design and Testing Lab (BECL606)	
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, NOR gate and any Boolean expression
CO5	Perform RTL_GDSII flow and understand the stages in ASIC design.

Year / SEM : 3rd year / 6 th sem	Year of Study : 2024-25
Course Name : System Modeling using Simulink (BEC657B)	
CO1	Create Simulink models to perform analog and digital computations.
CO2	Implement the Combinational Digital circuits and Sequential Digital Circuit models using Simulink
CO3	Implement analog and digital systems using the transfer functions in s-domain and z-domain respectively.
CO4	Demonstration of analog and digital communication modulation and demodulation using Simulink.

Year / SEM : 3rd year / 6 th sem	Year of Study : 2024-25
Course Name : Indian Knowledge System (BIKS609)	
CO1	Provide an overview of the concept of the Indian Knowledge System and its importance.
CO2	Appreciate the need and importance of protecting traditional knowledge.
CO3	Recognize the relevance of Traditional knowledge in different domains.
CO4	Establish the significance of Indian Knowledge systems in the contemporary world.

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Year / SEM : 4th year / 7 th sem	Year of Study : 2024-25

Course Name : Advanced VLSI (21EC71)	
CO1	Understand VLSI design flow
CO2	Describe the concepts of ASIC design methodology
CO3	Create floor plan including partition and routing with the use of CAD algorithms
CO4	Will have better insights into VLSI back-end design flow
CO5	Learn verification basics and System Verilog

Year / SEM : 4th year / 7 th sem	Year of Study : 2024-25
Course Name : Optical & Wireless Communication (21EC72)	
CO1	Classification and characterization of optical fibers with different modes of signal propagation.
CO2	Describe the constructional features and the characteristics of optical fiber and optical devices used for signal transmission and reception.
CO3	Understand the essential concepts and principles of mobile radio channel and cellular communication.
CO4	Describe various multiple access techniques used in wireless communication systems.
CO5	Describe the GSM architecture and procedures to establish call set up, call progress handling and call tear down in a GSM cellular network.

Year / SEM : 4th year / 7 th sem	Year of Study : 2024-25
Course Name : Digital Image Processing (21EC732)	
CO1	Understand image formation and the role of human visual system plays in perception of gray and color image data.
CO2	Compute various transforms on digital images.
CO3	Conduct independent study and analysis of Image Enhancement techniques.
CO4	Apply image processing techniques in frequency (Fourier) domain.
CO5	Design image restoration techniques.

Year / SEM : 4th year / 7 th sem	Year of Study : 2024-25
Course Name : Network Security (21EC742)	
CO1	Explain network security services and mechanisms and explain security concets
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

Year / SEM : 4th year / 7 th sem	Year of Study : 2024-25
Course Name : Multimedia Communication (21EC745)	
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.

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Year / SEM : 4th year r / 7 th sem	Year of Study : 2024-25
Course Name : Electric Vehicles (21EE752)	
CO1	Explain the roadway fundamentals, laws of motion, vehicle mechanics and propulsion system design.
CO2	Explain the working of electric vehicles and hybrid electric vehicles in recent trends.
CO3	Model batteries, Fuel cells, PEMFC and super capacitors
CO4	Analyze DC and AC drive topologies used for electric vehicle application.
CO5	Develop the electric propulsion unit and its control for application of electric vehicles.

Year / SEM : 4th year / 7 th sem	Year of Study : 2024-25
Course Name : Environment Protection and Management (21CV753)	
CO1	Appreciate the elements of Corporate Environmental Management systems complying to international environmental management system standards 2. 3.
CO2	Lead pollution prevention assessment team and implement waste minimization options
CO3	Develop, Implement, maintain and Audit Environmental Management systems for Organisations

HOD-ECE

PROFESSOR & HEAD
DEPT. OF ELECTRONICS & COMMUNICATION ENG
RAJARAJESWARI COLLEGE OF ENGG.
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Year / SEM : 2nd year / 4 th sem	Year of Study : 2024-25
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 : 2024-25
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 : 2024-25
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

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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 : 2024-25
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 : 2024-25
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 : 2024-25
Course Name:	
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.

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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 : 2024-25
Course Name: SIGNALS AND DSP (BEE502)	
CO1	Discuss classification and basic operations that can be performed on both continuous and discrete time signals and to understand sampling theorem.
CO2	Evaluate Discrete Fourier Transform of a sequence , to understand the various properties of DFT and signal segmentation using overlap and overlap add method.
CO3	Evaluate Discrete Fourier Transform of a sequence using decimation in time and decimation in frequency methods.
CO4	To design Butterworth and Chebyshev IIR digital filters and to represent the filters using different methods and to represent IIR filter using different methods.
CO5	To design FIR filters using windows method and frequency sampling method and to represent FIR filters using direct method and lattice method

Year / SEM : 3rd year / 5 th sem	Year of Study : 2024-25
Course Name: Power Electronics (BEE503)	
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 circuit
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.

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Year / SEM : 3rdyear / 5 th sem	Year of Study : 2024-25
Course Name: Power Electronics Laboratory (BEEL504)	
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 : 2024-25
Course Name: ELECTRIC VEHIVLE FUNDAMENTALS (BEE515C)	
CO1	Describe about working principle of electric vehicles.
CO2	Explain the construction and working principle of various motors used in electric vehicles
CO3	Understand about working principle of electronics and sensor less control in electric vehicles.
CO4	Describe the different types and working principle of hybrid vehicles.
CO5	Illustrate the various types and working principle of fuel cells.
Year / SEM : 3rdyear / 5 th sem	**Year of Study : 2024-25**
Course Name: Mini Project (BEE586)	
CO1	Analyse in a systematic way, think better, and perform better..

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Year / SEM : 3rd year / 5 th sem	Year of Study : 2024-25
Course Name: RESEARCH METHODOLOGY & IPR (BRMK557)	
CO1	To know the meaning of engineering research.
CO2	To know the procedure of the literature Review and Technical Reading
CO3	To understand the fundamentals of the patent laws and drafting procedure
CO4	. Understanding the copyright laws and subject matters of copyrights and designs
CO5	Under standing the basic principles of design rights

Year / SEM : 3rd year / 6 th sem	Year of Study : 2024-25
Course Name: POWER SYSTEM ANALYSIS I (BEE601)	
CO1	Model the power system components &construct per unit impedance diagram of power system.
CO2	Analyse three phase symmetrical faults on power system.
CO3	Compute unbalanced phasors in terms of sequence components and vice versa, also develop sequence networks.
CO4	Analyse various unsymmetrical faults on power system.
CO5	Examine dynamics of synchronous machine and determine the power system stability

Year / SEM : 3rd year / 6 th sem	Year of Study : 2024-25
Course Name: CONTROL SYSTEMS (BEE602)	
CO1	Analyze and model electrical and mechanical system using analogous.
CO2	Formulate transfer functions using block diagram and signal flow graphs.

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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 controllers and various compensators

Year / SEM : 3rd year / 6 th sem	Year of Study : 2024-25
Course Name: Electric Motor and Drive Systems for Electric Vehicles (BEE613D)	
CO1	.Explain the Fundamental and Performance of EV
CO2	Understand the Characteristics of motor control and energy consumption for EV operation
CO3	Analyse the Power electronics and sensors in DC motor electric vehicles.
CO4	Design and Analysethe induction motor drives and discuss methods for controlling them.
CO5	Comprehend the construction, working principle and controlof BLDC and SRM motors.

Year / SEM : 3rd year / 6 th sem	Year of Study : 2024-25
Course Name: CONTROL SYSTEM LABORATORY (BEEL606)	
CO1	Utilize software package and discrete components in assessing the time and frequency domain response of a given second order system.
CO2	Design, analyze and simulate Lead, Lag and Lag – Lead compensators for given specifications.
CO3	Determine the performance characteristics of ac and DC servomotors and synchro-transmitter receiver pair used in control systems.
CO4	Simulate the DC position and feedback control system to study the effect of P, PI, PD and PID controller and Lead compensator on the step response of the system.
CO5	Develop a script files to plot Root locus, Bode plot and Nyquist plot to study the stability

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Year / SEM : 3rd year / 6 th sem	Year of Study : 2024-25
Course Name: Project on Renewable Energy Sources(BEEL657D)	
CO1	Analyse in a systematic way, think better, and perform better.

Year / SEM : 4 th year / 7 th sem	Year of Study : 2024-25
Course Name: POWER SYSTEM ANALYSIS – 2– 21EE71	
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 : 2024-25
Course Name: POWER SYSTEM PROTECTION– 21EE72	
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.

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CO5	Discuss protection of generators, motors, Transformer and Bus Zone Protection.
CO6	Explain the principle of circuit interruption in different types of circuit breakers.

Year / SEM : 4 th year / 7 th sem	**Year of Study : 2024-25**

Course Name: HIGH VOLTAGE ENGINEERING – 21EE73

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 : 2024-25**

Course Name: ADVANCED CONTROL SYSTEMSS(Professional Elective) – 21EE741

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.

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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 : 2024-25
Course Name: UTILIZATION OF ELECTRICAL POWER(Professional Elective) – 21EE742	
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 : 2024-25
Course Name: CARBON CAPTURE AND STORAGE(Professional Elective)-21EE743	
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.

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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 : 2024-25
Course Name: POWER SYSTEM PLANNING (Professional Elective)–21EE744	
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 : 2024-25**
Course Name: FACTS AND HVDC TRANSMISSION (Professional Elective)-21EE751	
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.

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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 : 2024-25
Course Name: TESTING AND COMMISSIONING OF POWER SYSTEM APPARATUS(Professional Elective)– 21EE752	
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.

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Year / SEM : 4 th year / 7 th sem	Year of Study : 2024-25
Course Name: POWER SYSTEM SIMULATION LABORATORY–21EEL76	
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 : 2024-25
Course Name: POWER SYSTEM SIMULATION LABORATORY–21EEL76	
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.

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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 : 2024-25
Course Name: RELY AND HIGH VOLTAGE LABORATORY–21EEL77	
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 : 2024-25
Course Name: PROJECT PHASE – I AND SEMINAR–21EEP78	
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.

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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 : 2024-25
Course Name: POWER SYSTEM OPERATION AND CONTROL(Core Course) – 21EE81	
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 : 2024-25
Course Name: INDUSTRIAL DRIVES AND APPLICATIONS(Core Course) –21EE82	
CO1	Explain the advantages and choice of electric drive.
CO2	Explain dynamics and different modes of operation of electric drives.

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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 : 2024-25
Course Name: OPERATION AND MAINTENANCE OF SOLAR ELECTRICSYSTEMS (Professional Elective)–21EE832	
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 : 2024-25
Course Name: INTERNSHIP / PROFESSIONAL PRACTICE –21EE84	
CO1	Gain practical experience within industry in which the internship is done.

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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 : 2024-25
Course Name: PROJECT WORK PHASE -II–21EEP85	
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 : 2024-25
Course Name: SEMINAR21EES86	
CO1	Attain, use and develop knowledge in the field of electrical and electronics engineering and other disciplines through independent learning and collaborative study.

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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.

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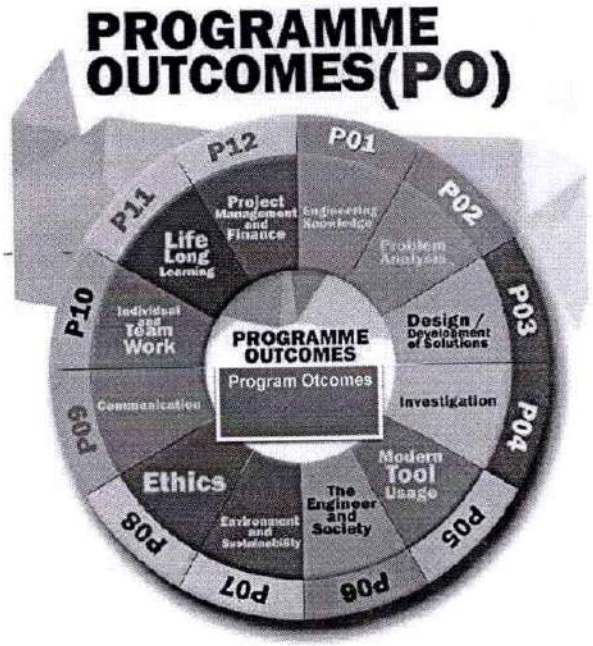
Department of Electrical and Electronics and Engineering

2.6.1 Program outcomes, program specific outcomes and course outcomes

ProgramOutcomes:



PO1: Engineering Knowledge
Apply mathematics, science, and engineering fundamentals to solve complex engineering problems.

PO2: Problem Analysis
Identify and analyze complex engineering problems using first principles and structured approaches.

PO3: Design/Development of Solutions
Design solutions considering public health, safety, cultural, societal, and environmental impacts.

PO4: Conduct Investigations of Complex Problems
Employ research methods, data analysis, experiment design, and information synthesis to draw valid conclusions.

PO5: Engineering Tool Usage
Select and apply modern engineering and IT tools—with understanding of their limitations—to complex tasks.

PO6: The Engineer and The World
A consolidated outcome merging "Engineer & Society" and "Environment & Sustainability," emphasizing societal and environmental responsibilities.

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PO7: Ethics
Practice ethical decision-making and professional norms, now expanded to include diversity and inclusive behavior.

PO8: Individual and Collaborative Team Work
Work effectively as an individual and in multidisciplinary teams, emphasizing inclusive and collaborative dynamics.

PO9: Communication
Communicate effectively and inclusively with engineering communities and society at large.

PO10: Project Management and Finance
Apply engineering and management principles for effective project management in multidisciplinary environments.

PO11: Life-long Learning
Cultivate adaptability, awareness of emerging technologies, and readiness for independent, lifelong 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

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Course Outcomes:

Year / SEM : 2nd year / 3rd sem	Year of Study : 2024-25
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 : 2024-25
Course Name: ELECTRIC CIRCUIT ANALYSISTECHNIQUES(BEE302)	
CO1	Understand the basic concepts, basic laws and methods of analysis of DC and AC networks and reduce the complexity of network using source shifting, source transformation and network reduction using 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 : 2024-25
Course Name: Analog Electronic Circuits (BEE303)	
CO1	Utilize the characteristics of transistor for different applications.

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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 : 2024-25
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 : 2024-25
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.

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Year / SEM : 2nd year / 3rd sem	Year of Study : 2024-25
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 : 2024-25
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 : 2024-25
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.

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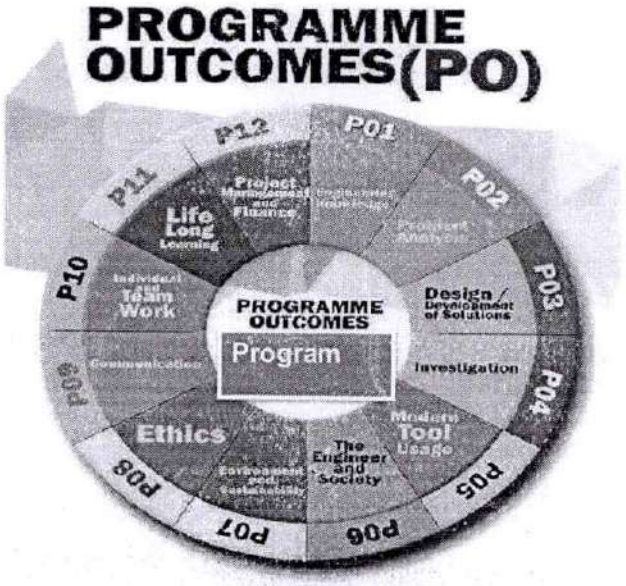
(CRITERIA- 2)

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 probiems 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.

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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.

Dr.SREENIVASA MURTHY.V Ph.D.,
Head of the department
Department of Information
Science and Engineering,
Rajarajeswari College of Engineering
Ramohalli Cross, Bengaluru-560074.

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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

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Academic Year: 2024-2025

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

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

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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

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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

Subject name: UI/UX **Sub. Code: BCS456C**

CO	Description
At the end of the course, the student will be able to:	
CO 1	Explain the user experience design requirements.
CO 2	Relate design thinking concepts and mental models to UX design

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CO3	Illustrate UX design in line with design goals, metrics and targets
CO4	Demonstrate different prototyping in relation with software engineering
CO5	Explain UX design principles with case examples

Subject name: Universal Human Values **Sub. Code: BUHK408**

CO	Description
At the end of the course, the student will be able to:	
CO 1	They would become more responsible in life and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind
CO 2	They would have better critical ability
CO3	They would also become sensitive to their commitment towards what they have understood (human values, human relationships, 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 direction

5th Semester

Subject name: Software Engineering & Project Management **Sub. Code: BCS501**

CO	Description
At the end of the course, the student will be able to:	
CO 1	Differentiate process models to judge which process model has to be adopted for the given scenarios.
CO 2	Derive both functional and nonfunctional requirements from the case study.
CO3	Analyze the importance of various software testing methods and agile methodology.
CO4	Illustrate the role of project planning and quality management in software development.
CO5	Identify appropriate techniques to enhance software quality.

Subject name: Computers Networks **Sub. Code: BCS502**

CO	Description
At the end of the course, the student will be able to:	
CO 1	Explain the fundamentals of computer networks.
CO 2	Apply the concepts of computer networks to demonstrate the working of various layers and protocols in communication network
CO3	Analyze the principles of protocol layering in modern communication systems.
CO4	Demonstrate various Routing protocols and their services using tools such as Cisco packet tracer.

Subject name: Theory of Computation **Sub. Code: BCS503**

CO	Description
At the end of the course, the student will be able to:	
CO 1	Apply the fundamentals of automata theory to write DFA, NFA, Epsilon-NFA and conversion between them.
CO 2	Prove the properties of regular languages using regular expressions
CO3	Design context-free grammars (CFGs) and pushdown automata (PDAs) for formal languages
CO4	Design Turing machines to solve the computational problems
CO5	Explain the concepts of decidability and undecidability.

Subject name: Data Visualization Lab **Sub. Code: BAIL504**

CO	Description
At the end of the course, the student will be able to:	
CO 1	Design the experiment to create basic charts and graphs using Tableau and Power BI.
CO 2	Develop the solution for the given real-world problem.
CO3	Analyze the results and produce substantial written documentation

Subject name: Artificial Intelligence **Sub. Code: BCS515B**

CO	Description
At the end of the course, the student will be able to:	
CO 1	Explain the architecture and components of intelligent agents, including their interaction with the AI environment.
CO 2	Apply problem-solving agents and various search strategies to solve a given problem
CO3	Illustrate logical reasoning and knowledge representation using propositional and first-order logic
CO4	Demonstrate proficiency in representing knowledge and solving problems using first-order logic
CO5	Describe classical planning in the context of artificial intelligence, including its goals, constraints, and applications in problem-solving.

Subject name: RESEARCH METHODOLOGY & IPR **Sub. Code: BRMK557**

CO 1	To know the meaning of engineering research
CO 2	To know the procedure of the literature Review and Technical Reading
CO3	To understand the fundamentals of the patent laws and drafting procedures.
CO4	Understanding the copyright laws and subject matters of copyrights and designs.
CO5	Understanding the basic principles of design rights

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Subject name: Environmental Studies and E-Waste Management **Sub. Code: BCS508**

CO	Description
At the end of the course, the student will be able to:	
CO 1	Comprehend the principles of ecology and environmental issues pertaining to air, land, and water on a global scale
CO 2	Acquire observation skills for solving problems related to the environment.
CO3	Conduct survey to describe the realities of waste management system

6th Semester

Subject name: Full Stack Development **Sub. Code: BIS601**

CO	Description
At the end of the course, the student will be able to:	
CO 1	Apply Javascript to build dynamic and interactive Web projects
CO 2	Implement user interface components for JavaScript-based Web using React.JS
CO3	Apply Express/Node to build web applications on the server side.
CO4	Develop data model in an open source nosql database
CO5	Demonstrate modularization and packing of the front-end modules .

Subject name: Machine Learning **Sub. Code: BCS602**

CO	Description
At the end of the course, the student will be able to:	
CO 1	Describe the machine learning techniques, their types and data analysis framework.
CO 2	Apply mathematical concepts for feature engineering and perform dimensionality reduction to enhance model performance
CO3	Develop similarity-based learning models and regression models for solving classification and prediction tasks
CO4	Build probabilistic learning models and design neural network models using perceptrons and multilayer architectures
CO5	Utilize clustering algorithms to identify patterns in data and implement reinforcement learning techniques

Subject name: Internet of Things **Sub. Code: BIS613B**

CO	Description
At the end of the course, the student will be able to:	
CO 1	Explain the fundamentals of IoT and its architecture.
CO 2	Compare IoT access technology IEEE 802.15.4 with few other related standards.

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CO3	Summarize network layer and application protocols in the view of IoT.
CO4	Explain the data analytics concepts for IoT and Security concerns.
CO5	Apply IoT concepts on an opensource IoT platform for the given real-world problem/scenario.

Subject name: Machine Learning lab **Sub. Code: BCSL606**

CO	Description
At the end of the course, the student will be able to:	
CO 1	Illustrate the principles of multivariate data and apply dimensionality reduction techniques.
CO 2	Demonstrate similarity-based learning methods and perform regression analysis
CO3	Develop decision trees for classification and regression problems, and Bayesian models for probabilistic learning.
CO4	Implement the clustering algorithms to share computing resources

Subject name: Devops **Sub. Code: BCSL657D**

CO	Description
At the end of the course, the student will be able to:	
CO 1	Demonstrate different actions performed through Version control tools like Git.
CO 2	Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle
CO3	Experiment with configuration management using Ansible.
CO4	Demonstrate Cloud-based DevOps tools using Azure DevOps.

Subject name: Project Phase – 1 **Sub. Code: BIS685**

CO	Description
After completing the course, the students will be able to:	
CO 1	Demonstrate a sound technical knowledge of their selected project topic
CO 2	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 form.
CO5	Demonstrate the knowledge, skills and attitudes of a professional engineer.

Subject name: Indian Knowledge Systems **Sub. Code: BIKS609**

CO	Description
After completing the course, the students will be able to:	
CO 1	Provide an overview of the concept of the Indian Knowledge System and its importance.
CO 2	Appreciate the need and importance of protecting traditional knowledge.
CO3	Recognize the relevance of Traditional knowledge in different domains.
CO4	Establish the significance of Indian Knowledge systems in the contemporary world.

7th SEMESTER

Subject name: Cryptography and Network Security **Sub. Code: 21IS71**

CO	Description
At the end of the course, the student will be able to:	
CO1	Understand Cryptography, Network Security theories, algorithms and systems
CO2	Apply different Cryptography and Network Security operations on different applications
CO3	Analyze different methods for authentication and access control
CO4	Evaluate Public and Private key, Key management, distribution and certification
CO5	Design necessary techniques to build protection mechanisms to secure computer networks
CO6	Analyze web contents and Social Networks to provide analytics with relevant visualization tools.

Subject name: Cloud Computing **Sub. Code: 21CS72**

CO	Description
At the end of the course, the student will be able to:	
CO1	Understand and analyze various cloud computing platforms and service provider
CO2	Illustrate various virtualization concepts.
CO3	Identify the architecture, infrastructure and delivery models of cloud computing
CO4	Understand the Security aspects of CLOUD
CO5	Define platforms for development of cloud applications

Subject name: Internet of Things **Sub. Code: 21CS735**

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

Subject name: Software Architecture and Design Patterns **Sub. Code: 21CS741**

CO	Description
At the end of the course, 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: Technical Seminar- **Sub. Code: 21IS81**

CO	Description
At the end of the course, the student will be able to:	
CO1	To demonstrate the different surveys to understand the current industrial requirements.
CO2	To analyze different technical requirements and demonstrate interactive skills.
CO3	To demonstrate presentation skills.
CO4	To demonstrate analytical skills.
CO5	To examine the intensity of the interactive sessions

Subject name: NSS/YOGA/PE - - **Sub. Code: 21NS83/21PE83/21YO83**

CO	Description
At the end of the course, the student will be able to:	
CO1	The importance of fitness/sports in day-to-day life
CO2	Benefits of Yoga on fitness and health
CO3	Understand the importance of his/her responsibility towards the society
CO4	Analyze the environmental and societal problems/issues and will be able to design solutions for the same

Dr.SREENIVASA MURTHY V Ph.D.
Head of the department
Department of Information
Science and Engineering
Rajarajeswari College of Engineering
Ramohalli Cross, Bangalore 560074.

Principal
RAJARAJESWARI
COLLEGE OF ENGINEERING
Ramohalli Cross, Bangalore

PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES OF ALL DEPARTMENTS– 2024-25

(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, modelling 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.

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Dept. of Robotics and Automation
RajaRajeswari College of Engineering
Bengaluru-74.

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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: 2024-25**
Course Name: – Mathematics-I for ME-B24MAME101	
CO1	Test the consistency of a system of linear equations and to solve them by direct and iterative methods
CO2	Apply the knowledge of calculus to solve problems related to polar curves and its applications in Determining the bentness of a curve
CO3	Learn the notion of partial differentiation to calculate rate of change of multivariate functions and solve problems related to composite functions and Jacobian
CO4	Understand that physical systems can be described by Differential equations and solve such equations.
CO5	Analyze the solution of linear and non-linear Differential equations
Year / SEM: 1st year / 1st sem	**Year of Study: 2024-25**
Course Name: –Applied Chemistry for ME- B24CHME102/202	
CO1	Understand and apply the principles of chemistry involved in water treatment, corrosion, energy sources, polymers, nanomaterials, phase equilibria, alloys, ceramics and instrumental methods of analysis
CO2	Analyse the Engineering problems and draw meaningful inferences through applied chemistry
CO3	Implement sustainable solutions through concepts of Applied Chemistry in the field of Materials, Energy and Environment
CO4	Engage in self-study and make an effective oral presentation on contribution of Chemistry to society

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CO5	Apply the knowledge of chemistry to investigate engineering materials by volumetric and instrumental methods and analyze, interpret the data to assess and address the issues of Environmental Pollution
Year / SEM: 1st year / 1st sem	**Year of Study: 2024-25**
Course Name: –Introduction to Electronics-B24ESCK143/243	
CO1	Develop the basic knowledge on construction and characteristics of semiconductor devices
CO2	Summarize the basic concept of small-scale circuits using BJT, JFET, MOSFET scale circuits
CO3	Apply the knowledge on various applications of operational amplifiers
CO4	Understand the concepts of Boolean algebra and Logic circuits
CO5	Illustrate the outline of Communication system.
Year / SEM: 1st year / 1st sem	**Year of Study: 2024-25**
Course Name: -Introduction to Python Programming-B24PLCK152/252	
CO1	Understand the fundamental programming constructs to solve basic computational problems.
CO2	Learn the flow of execution and the need for debugging to rectify program bugs proficiently
CO3	Utilize the methods to create and manipulate the importance of data structures in problem-solving.
CO4	Know the structured and modular code using appropriate Object-Oriented Programming paradigms
CO5	Apply the acquired skills to provide solutions to real-world problems
Year / SEM: 1st year / 1st sem	**Year of Study: 2024-25**
Course Name: –Computer Aided Engineering Drawing-B24CEDK103/203	
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 through its graphical representation
Year / SEM: 1st year / 1st sem	**Year of Study: 2024-25**
Course Name: – Communicative English-B24ENGK106	
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: 2024-25**
Course Name: – Balake Kannada-B24HBKK107/207	
CO1	To understand the necessity of learning of local language for comfortable life.
CO2	To speak, read and write Kannada language as per requirement.
CO3	To communicate (converse) in Kannada language in their daily life with kannada speakers.
CO4	To Listen and understand the Kannada language properly
CO5	To speak in polite conservation

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Dept. of Robotics and Automation Engg
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Bengaluru-74.

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Kambipura, Kengeri, Bengaluru-74

Year / SEM: 1st year / 1ST Sem	Year of Study: 2024-25
Course Name: –Scientific Foundations of Health-B24SFHK108/208	
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: 2nd year / 3rd sem	Year of Study: 2024-25
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: 2024-25
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: 2024-25
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: 2024-25
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: 2024-25

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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 : 2024-25
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: 2024-25
Course Name: – Applications of MAT LAB- BRA358B	
CO1	Having an ability to apply mathematics and science in engineering applications
CO2	Having a clear understanding of the subject related concepts and of contemporary issues.
CO3	Having problem solving ability- solving social issues and engineering problems.
Year / SEM: 2nd year / 3rd Sem	Year of Study: 2024-265
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: 2024-25
Course Name: – MANAGERIAL ECONOMICS FOR ROBOTICS-BRA501	
CO1	**Define** key concepts of managerial economics, including cost analysis, market structures, and innovation management, specifically within the context of the robotics industry.
CO2	**Explain** the role of managerial economics in decision-making processes relevant to the robotics and technology industries.
CO3	**Apply** cost-volume-profit analysis and capital budgeting techniques to evaluate the financial viability of robotics projects
CO4	**Analyze** the impact of different market structures on the competitive strategies and pricing behaviors of robotics companies
CO5	**Evaluate** the economic and social impacts of robotics on labor markets, including automation, job displacement, and the long-term growth of economies
Year / SEM: 3rd year / 5th Sem	Year of Study: 2024-25
Course Name: – HYDRAULICS AND PNEUMATICS- BRA502	

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CO1	Explain the knowledge gained on hydraulic and pneumatic systems and its components.
CO2	Understand the working principle of various hydraulic and pneumatic components
CO3	Apply working principles of Hydraulic and Pneumatic Systems for various applications.
CO4	Determine cause for hydraulic and pneumatic system break down and performance of hydraulic pumps, motors
Year / SEM: 3rd year / 5th sem	**Year of Study : 2024-25**
Course Name:– ROBOT OPERATING SYSTEM-BRA503	
CO1	Demonstrate Proficiency in ROS Architecture
CO2	Manage and Utilize ROS Packages and Filesystems
CO3	Implement and Test ROS Communication Mechanisms:
CO4	Engage with and Contribute to the ROS Community
Year / SEM: 3rd year / 5th Sem	**Year of Study: 2024-25**
Course Name: – VIRTUAL INSTRUMENTATION LAB-BRAL504	
CO1	Understand, design and develop data acquisition systems for Various Sensor using DAQ Cards.
CO2	Analyze the importance& applications of LabVIEW in real time Environment
Year / SEM: 3rd year / 5th Sem	**Year of Study : 2024-25**
Course Name: – WIRELESS SENSORS NETWORKS FOR ROBOTICS-BRA515C	
CO1	Recall the basic concepts and components of wireless sensor networks, including types of wireless sensor networks, single-node architecture, and network architecture.
CO2	Explain the functions of single-node architecture, network architecture, and MAC protocols in wireless sensor networks.
CO3	Apply the concepts of MAC protocols and energy-efficient routing to design a basic wireless sensor network architecture
CO4	Analyze the energy consumption patterns and optimization goals in different wireless sensor network architectures
CO5	Evaluate the effectiveness of different MAC protocols and routing strategies in achieving energy efficiency in wireless sensor networks
Year / SEM: 3rd / 5th sem	**Year of Study: 2024-25**
Course Name: – Environmental Studies- BESK508	
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 as legislation
CO3	Apply their ecological knowledge to illustrate and grasp the problem and describe the realities that managers face when dealing with complex issues.
Year / SEM: 3rd year / 5th sem	**Year of Study: 2024-25**
Course Name: – Research methodology & intellectual property rights – BRMK557	
CO1	To know the meaning of engineering research.
CO2	To know the procedure of the literature Review and Technical Reading
CO3	To understand the fundamentals of the patent laws and drafting procedure
CO4	Understanding the copyright laws and subject matters of copyrights and designs
CO5	Under standing the basic principles of design rights
Year / SEM: 4th year / 7th sem	**Year of Study: 2024-25**
Course Name: – INDUSTRIAL ROBOTICS: Field and Service Robotics- 21RA71	
CO1	Use different types of robots for different industrial applications.

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CO2	Analyze the different advanced inspection methods.
CO3	Understand the use of robots for other applications.
CO4	Selection of robots for different applications.
CO5	Understand more advanced material handling systems.
Year / SEM: 4th year / 7th sem	**Year of Study: 2024-25**
Course Name: – Industrial Data Networks-21RA72	
CO1	Ability to define basic concepts of data communication and its importance
CO2	Ability to explain the various internetworking devices involved in industrial networks
CO3	Ability to explain the various serial communication used in process industries.
CO4	Ability to illustrate, compare and explain the working of HART and Field bus used in process digital communication.
CO5	Ability to summarize the operation of MODBUS, PROFIBUS protocol and its applications
CO6	Ability to explain and adopt the different Industrial Ethernet protocol and usage of wireless communication in process applications
Year / SEM: 4th year / 7th sem	**Year of Study: 2024-25**
Course Name: –Total Quality Management- 21RA731	
CO1	Explain the various approaches of TQM
CO2	Infer the customer perception of quality
CO3	Analyse customer needs and perceptions to design feedback systems
CO4	Apply statistical tools for continuous improvement of systems
CO5	Apply the tools and technique for effective implementation of TQM.
Year / SEM: 4th year / 7th sem	**Year of Study: 2024-25**
Course Name: –Motors Drives and Power Electronics- 21RA741	
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.
Year / SEM: 4th year / 7th sem	**Year of Study: 2024-25**
Course Name: – ELECTRIC VEHICLES- 21EE752	
CO1	Explain the roadway fundamentals, laws of motion, vehicle mechanics and propulsion system design
CO2	Explain the working of electric vehicles and hybrid electric vehicles in recent trends
CO3	Model batteries, Fuel cells, PEMFC and super capacitors.
CO4	Analyze DC and AC drive topologies used for electric vehicle application
CO5	Develop the electric propulsion unit and its control for application of electric vehicles.

Professor & Head
Dept. of Robotics and Automation Engg
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Year / SEM: 1st year / 2nd sem	Year of Study: 2024-25
Course Name: – Mathematics-II for ME-B24MAME201	
CO1	Apply the concept of change of order of integration and variables to evaluate Multiple Integrals and their usage in computing area and volume.
CO2	Understand the applications of vector calculus refer to solenoidal, and irrotational vectors. Orthogonal curvilinear coordinates.
CO3	Demonstrate partial differential equations and their solutions for physical interpretations
CO4	Apply the knowledge of numerical methods in analyzing the discrete data and solving the physical and engineering problems.
CO5	Apply the knowledge of numerical methods in analyzing the solution of first order differential equations
Year / SEM: 1st yr/ 2nd sem	**Year of Study: 2024-25**
Course Name: – Applied Physics for ME-B24PHME102/202	
CO1	Elucidate the concepts in oscillations, waves, elasticity and material failures
CO2	Describe the elastic properties of materials and failures of engineering materials.
CO3	Summarize concepts of acoustics in buildings and explain the concepts in radiation and photometry.
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: 2024-25**
Course Name: –Elements of Mechanical Engineering- B24EMME203	
CO1	Explain the role of mechanical engineering in industry and society, fundamentals of steam and non-conventional energy sources
CO2	Describe different conventional & advanced machining processes, IC engines, propulsive devices, air-conditioning, and refrigeration
CO3	Explain different gear drives, gear trains and different joining processes.
CO4	Determine the condition of steam and its energy, performance parameters of IC engines, velocity ratio and power transmitted through power transmission systems
CO5	Explain the aspects of future mobility and the fundamentals of robotics
Year / SEM: 1st year / 2nd sem	**Year of Study: 2024-25**
Course Name:– Introduction to IoT-B24ETCK156/256	
CO1	Describe the basics of Networking, Predecessors of IoT, and the emergence of IoT
CO2	Classify various sensing devices and actuator types
CO3	Demonstrate the processing Topologies in IoT and types
CO4	Explain IoT Connectivity technologies and Associated IoT technologies
CO5	Illustrate the architecture of IoT Applications
Year / SEM: 1st year / 2nd sem	**Year of Study: 2024-25**
Course Name: – Introduction to C Programming-B24ESCK145/245	
CO1	Learn the working principles of computer, various functions of peripheral devices and fundamental concept of C programming language.
CO2	Understanding the procedural programming constructs of C language to solve the real-world problem
CO3	Understand the user defined data structures like arrays in implementing solutions to searching and sorting methods
CO4	Learn the use of strings, structures, union, pointers and I/O files to solve a realistic problem
CO5	Know the solutions to problems using modular programming constructs using functions

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Year / SEM: 1st year / 2nd sem	Year of Study: 2023-24
Course Name: – Professional Writing Skills- B24PWSK206	
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: – Innovation and Design Thinking- B24IDTK108/208	
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	Identify the significance of reverse Engineering to Understand products
Year / SEM: 1st year / 2nd sem	**Year of Study: 2024-25**
Course Name: – Constitution of India- B24HCIK107/207	
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: 2nd year / 4th sem	**Year of Study: 2024-25**
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: 2024-25**
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: 2024-25**
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.

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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: 2024-25**
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: 2024-25**
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: 2024-25**
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: 2024-25**
Course Name: - Quality Control and Maintenance Management-BRA601	
CO1	Able to Define and explain the importance of quality in both manufacturing and service industries
CO2	Able to Apply TQM principles to real-world scenarios, including leadership in quality management, strategic quality planning, and the formation of quality councils
CO3	Able to use traditional and new quality management tools effectively, including the seven traditional tools of quality, Six Sigma methodologies, and benchmarking processes.
CO4	Able to **understand and implement** different types of maintenance strategies, such as preventive, predictive, corrective, and breakdown maintenance.
Year / SEM: 3rd year / 6th sem	**Year of Study: 2024-25**
Course Name: -Additive Manufacturing-BRA602	
CO1	Understand the working principle and process parameters of AM processes
CO2	Explore the applications of AM processes in various fields
CO3	Select the suitable material and process for fabricating a given product
CO4	Apply the knowledge in Material science in Additive Manufacturing components
CO5	Design and develop a product for AM Process
Year / SEM: 3rd year / 6th sem	**Year of Study: 2024-25**

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Course Name: -Artificial Intelligence for Automation-BRA613D	
CO1	Recall the fundamental concepts of industrial automation and the foundational aspects of artificial intelligence and machine learning.
CO2	Explain the key principles and strategies of industrial automation, artificial intelligence and machine learning, including their applications in automation and decision-making processes
CO3	Apply the artificial intelligence techniques to solve basic automation problems and optimize manufacturing processes
CO4	Analyze the effectiveness of automation and artificial intelligence techniques in optimizing and improving decision-making in Automation.
CO5	Evaluate the impact on the efficiency and effectiveness of industrial processes, considering various optimization techniques and real-world applications
Year / SEM: 3rd year / 6th sem	Year of Study: 2024-25
Course Name: -FINITE ELEMENT ANALYSIS LAB- BRAL606	
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: 2024-25
Course Name: -Operation Management-BRA 657C	
CO1	Understand the fundamental concepts and techniques of operations management and their application in manufacturing and service industries.
CO2	Analyze and optimize operational processes using tools and techniques for process design, inventory management, and production planning
CO3	Implement quality management principles and techniques such as TQM, Six Sigma, and lean manufacturing to improve operational efficiency
CO4	Develop and manage effective supply chain strategies, including logistics, vendor management, and supplier relationship management.
CO5	Develop and manage effective supply chain strategies, including logistics, vendor management, and supplier relationship management.
Year / SEM: 3rd year / 6th sem	Year of Study: 2024-25
Course Name: -TECHNOLOGIES OF RENEWABLE ENERGY SOURCES- BEE654B	
CO1	Discuss causes of energy scarcity and its solution, energy resources and availability of renewable energy. Outline energy from sun, energy reaching the Earth's surface and solar thermal energy applications
CO2	Discuss types of solar collectors, their configurations, solar cell system, its characteristics and their applications.
CO3	Explain generation of energy from hydrogen, wind, geothermal system, solid waste and agriculture refuse.
CO4	Discuss production of energy from biomass, biogas
CO5	Summarize tidal energy resources, sea wave energy and ocean thermal energy
Year / SEM: 3rd year / 6th sem	Year of Study: 2024-25
Course Name: -INDIAN KNOWLEDGE SYSTEM-BIKS609	
CO1	Provide an overview of the concept of the Indian Knowledge System and its importance
CO2	Appreciate the need and importance of protecting traditional knowledge.
CO3	Recognize the relevance of Traditional knowledge in different domains.
CO4	Establish the significance of Indian Knowledge systems in the contemporary world.

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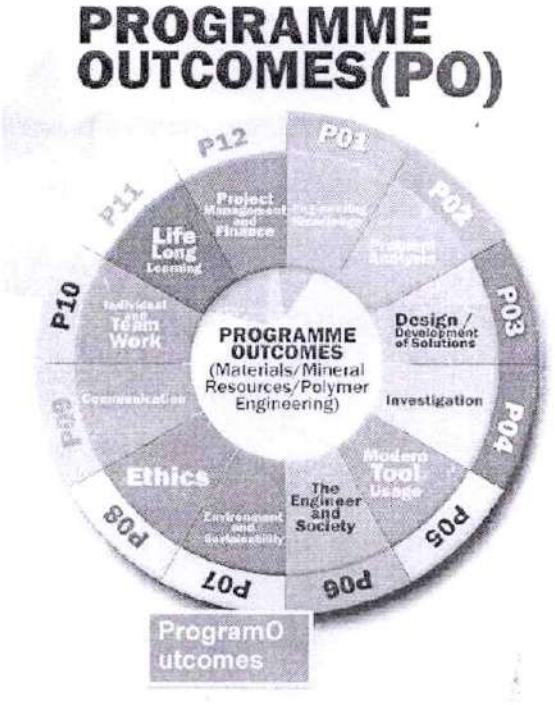
PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES OF ALL DEPARTMENTS–

2024-25(CRITERIA-2)

Department of Management Studies

2.6.1 Program outcomes, program specific outcomes and course outcomes

Program Outcomes:



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PROGRAM OUTCOMES

1. Apply knowledge of management theories and practices to solve business problems.

2. Foster analytical and critical thinking abilities for data-based decision making.

3. Ability to develop value-based leadership.

4. Ability to understand, analyse and communicate global, economic, legal and ethical aspects of business.

5. Ability to lead themselves and others in the achievement of organizational goals contributing effectively to a team environment.

PROGRAM SPECIFIC OUTCOMES (PSOs):

The post graduate students of the department shall be able to

PSO1) Comprehend the contemporary features and characteristics of Business Management Science and its administration

PSO2) Analyse and interpret the dynamic situations for making Business Management strategies and decisions at the national and global level

PSO3) Handle responsibility with the ethical values for all actions undertaken by them.

PSO4) Adapt and focus on achieving the organisational goal and objectives with complete zeal and commitment.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

- MBA is a two-year full-time programme, aimed at nurturing and training young minds with contemporary skills of management, adept in handling diverse sectors of the economy.
- The programme intends to inculcate leadership qualities in individuals to strategically position themselves in all emerging platforms of idea generation, creation of pragmatic knowledge, skills and competency development.
- The diverse course curriculum enables a high degree of academic flexibility for fostering innovation and creativity. It instils resilience and adaptability in students for facing the challenges of the contemporary business world.

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Course outcomes (COs) 2022 Scheme

Year /SEM:1st year/1st SEM

Year /SEM:1st year/1st SEM	Year of Study:2022-23
Course Name: Principles of Management and Organisational Behaviour-22MBA11	
CO1	To understand theories and models of Management and OB.
CO2	To classify and differentiate between various methods of problem solving.
CO3	To compile an adept framework for solving the problems at the workplace.
CO4	To acquaint the students with industry relevant skill sets.

Year /SEM:1st year/1st SEM	Year of Study:2022-23
Course Name: ENTREPRENEURSHIP DEVELOPMENT-22MBA12	
CO1	To develop and strengthen entrepreneurial qualities and motivation among students.
CO2	To impart basic entrepreneurial skills and understandings to run a business efficiently and effectively.
CO3	To provide insights to students on entrepreneurship opportunities, sources of funding and institutions supporting entrepreneurs.
CO4	To make students understand the ways of starting a company of their own.

Year /SEM:1st year/1st SEM	Year of Study:2022-23
Course Name: Accounting for Managers-22MBA13	
CO1	To enable the students to understand the conceptual framework of accounting, reporting and financial statements
CO2	To enable the students in preparation of books of accounts and accounting records leading to final accounts and interpretation there-off.
CO3	To acquaint the students with interpretation of accounting information and analyses of financial statements for decision making

Year /SEM:1st year/1st SEM	Year of Study:2022-23
Course Name: STATISTICS FOR MANAGERS-22MBA14	
CO1	To facilitate the students to compute the various measures of central tendency and dispersion using descriptive statistics
CO2	To enhance the skills to visualize and estimate the relationship between variables using correlation and regression analysis.
CO3	To equip with the skills of decision-making using probability techniques.
CO4	To empower with the knowledge of trend analysis
CO5	To make the students understand the procedure of hypothesis testing using appropriate parametric and non-parametric tests
CO6	To familiarize the students with analytical package SPSS.

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Year /SEM:1st year/1st SEM	Year of Study:2022-23
Course Name: MARKETING MANAGEMENT-22MBA15	
CO1	To make students understand the fundamental concepts of marketing and environment in which marketing system operates
CO2	To gain knowledge on consumer buying behaviour and influencing factors
CO3	To describe major bases for segment marketing, target marketing, and market positioning
CO4	To develop a Conceptual framework, covering basic elements of the marketing mix
CO5	To understand fundamental premise underlying market driven strategies and hands on practical approach

Year /SEM:1st year/1st SEM	Year of Study:2022-23
Course Name: BUSINESS COMMUNICATION-22MBA16	
CO1	To enable the students to become aware of their communication skills and sensitize them to their potential to become successful managers.
CO2	To enable learners with the mechanics of writing and also help them to draft business letters in English precisely and effectively
CO3	To introduce the students to some of the practices in managerial communication those are in vogue.
CO4	To prepare students to develop the art of business communication with emphasis on analysing business situations
CO5	To train Students towards drafting business proposals

Year /SEM:1st year/2nd SEM

Year /SEM:1st year/2nd SEM	Year of Study:2022-23
Course Name: HUMAN RESOURCE MANAGEMENT-22MBA21	
CO1	Recite the theories and various functions of Human Resources Management
CO2	Describe and explain in her/his own words, the relevance and importance of Human Resources Management at workplace
CO3	Apply and solve the workplace problems through Human Resources Management intervention
CO4	Compare and contrast different approaches of HRM for solving the complex issues and problems at the workplace
CO5	Design and develop an original framework and model in dealing with the problems in the organization

Year /SEM:1st year/2nd SEM	Year of Study:2022-23
Course Name: FINANCIAL MANAGEMENT -22MBA22	

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CO1	To familiarise the students with basic concepts of financial management and financial system.
CO2	To understand the concept of time value of money and its implication.
CO3	To evaluate investment proposals.
CO4	To understand the management of working capital in an organization
CO5	To analyse the capital structure and dividend decision of an organisation

Year /SEM:1st year/2nd SEM	Year of Study:2022-23
Course Name: Research Methodology and IPR-22MBA23	
CO1	To understand the basic components of research design
CO2	To Gain an insight into the applications of research methods
CO3	To equip students with various research analytical tools used in business research
CO4	To provide the insights of IPR and IPR system in India

Year /SEM:1st year/2nd SEM	Year of Study:2022-23
Course Name: OPERATIONS RESEARCH-22MBA24	
CO1	To Understand the mathematical tools that are needed to solve optimization problems
CO2	To Elucidate optimisation techniques for various problems
CO3	To understand and practice allocation problems, Assignment problems, Transportation problems and Network Analysis (PERT & CPM).

Year /SEM:1st year/2nd SEM	Year of Study:2022-23
Course Name: STRATEGIC MANAGEMENT-22MBA25	
CO1	To provide insights into the core concepts of strategic management
CO2	To evaluate various business strategies in dynamic market environments
CO3	To gain insights into various strategic management models.

Year /SEM:1st year/2nd SEM	Year of Study:2022-23
Course Name: MANAGERIAL ECONOMICS-22MBA26	
CO1	To introduce the fundamentals, tools and theories of managerial economics
CO2	To provide an understanding of the application of Economics in Business
CO3	To learn the basic Micro and Macro-economic concepts
CO4	To understand Demand, Production, Cost, Profit and Market competitions with reference to firm and industry.

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Year /SEM:2nd year/3rd SEM

Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: LOGISTICS AND SUPPLY CHAIN MANAGEMENT-22MBA31	
CO1	To understand the basic concepts of logistics and supply chain management
CO2	To provide insights for establishing efficient, effective and sustainable supply chains.
CO3	To comprehend the role of Information Technology in warehousing, transportation and Inventory management in SCM
CO4	To gain knowledge about international logistics and environment

Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: Information Technology for Managers-22MBA302	
CO1	To make students understand the concept of information technology importance in today's corporate world.
CO2	To create awareness about various Applications and emerging technologies available and its usages for excel the service in corporate sector
CO3	To create awareness about role of MIS and its contributions to Corporate
CO4	To make students understand Role of Computers/Social science software contributions.

Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: CONSUMER BEHAVIOUR-22MBAMM303	
CO1	To develop an understanding of consumer behaviour theories and apply this understanding in a marketing decision making context
CO2	To identify the multitude of factors influencing consumers so that each of us will be able to apply this knowledge to improve market strategy
CO3	To Create better marketing programs and strategies basing on the knowledge of consumer behaviour.

Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: Sales and Retail Management-22MBAMM304	
CO1	To provide an understanding of the concepts, techniques and approaches in Sales Management.
CO2	To emphasize on the Sales Manager's problems and dilemmas
CO3	To develop skills for generating, evaluating and selecting sales strategies
CO4	To develop an understanding of the contemporary retail management, issues, strategies and trends.
CO5	To highlight the importance of retailing and its role in the success of modern business
CO6	To acclimatize with the insights of retailing, key activities and relationships.

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Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: SERVICES MARKETING-22MBAMM305	
CO1	To acquaint the students with the characteristics of services and their marketing implications
CO2	To discuss and conceptualize the service quality, productivity in services, role of personnel in service marketing and to manage changes in the environment.
CO3	To familiarize the students with the GAPS model and strategizing towards closing the GAPS for effective services marketing.

Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: RURAL MARKETING-22MBAMM306	
CO1	Make students have an understanding of the fundamental concepts of rural marketing & the environment in which rural marketing system operates
CO2	To gain the knowledge on consumer buying behavior and influencing factors on consumer buying behavior at rural market and the decision process
CO3	To understand the promotional mix in rural markets
CO4	To understand premise underlying in rural markets
CO5	To comprehend the initiatives and future of rural markets

Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: Strategic Cost Management-22MBAFM303	
CO1	To understand various concepts and terminologies used in cost management
CO2	To explain and critically evaluate various costing methods and techniques such as marginal costing, budgetary control, standard costing, activity based costing etc.
CO3	To apply and analyse various costing methods and techniques mentioned above.

Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT-22MBAFM304	
CO1	To acquaint students with fundamental concepts of capital market and its instruments.
CO2	To understand techniques to evaluate and analyze risk and return characteristics of securities such as individual stocks, mutual funds etc
CO3	To provide basic knowledge of the theories and practices of modern portfolio choice and investment decision

Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: ADVANCED FINANCIAL MANAGEMENT-22MBAFM305	
CO1	To understand the concept capital structure and capital structure theories.
CO2	To assess the dividend policy of the firm.
CO3	To be aware of the management of working capital and it's financing.

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CO4	To understand the techniques of managing different components of working capital.
CO5	To evaluate the impact of financial decisions on the strategic direction of the organisation
CO6	To Identify and evaluate the exposure of a company to financial risk and the techniques required to manage this risk
CO7	To Evaluate complex investment appraisal situations and appreciate the importance of the cost of capital to the organisation and how the capital structure chosen will impact upon this
CO8	To Analyse the key strategic financial issues that must be considered in an acquisition or merger, including valuation of the target company

Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: Banking & Services Operations-20MBAFM306	
CO1	To understand the Structure and functions of Public sector Banks and Commercial Banking in India
CO2	To learn the functions of various Financial Services in India
CO3	To understand role of Banking and Financial Services in Business organizations
CO4	To know the functioning of NBFC 's in India

Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: RECRUITMENT AND SELECTION-22MBAHR303	
CO1	To recite the theories and various steps involved in Recruitment and Selection
CO2	To describe and explain in her/his own words, the relevance and importance of Recruitment and Selection in the Organization
CO3	To apply and solve the workplace problems through Recruitment and Selection intervention
CO4	To classify and categorize in differentiating between the best method to be adopted by organization related to Recruitment and Selection
CO5	To compare and contrast different approaches of Recruitment and Selection framework for solving the complex issues and problems
CO6	To design and develop an original framework and framework in dealing with the problems in the organization

Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: Industrial Relations And legislations-22MBAHR304	
CO1	To describe and Identify the application of Labour Laws regulating Industrial Relations in Organisation
CO2	To describe and explain in her/his own words, the relevance and importance of Labour Laws and Industrial Relations in Organisation
CO3	To apply and solve the workplace problems through Labour Laws
CO4	To classify and categorise different Laws and Codes

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CO5	To create and reconstruct Industrial Relations System to be adopted in the Organisation
CO6	To appraise and judge the practical applicability of Labour Laws regulating Industrial Relations in Organisation

Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: ORGANISATIONAL CHANGE AND DEVELOPMENT-22MBAHR305	
CO1	The student will be able to describe and identify the application of various OC/D framework
CO2	The student will be able to describe and explain in her/his own words, the relevance and importance of various OC/D intervention to be adopted in the Organisation
CO3	The student will be able to apply and improve the workplace effectiveness through various OC/D Intervention
CO4	The student will be able to classify and categorise different OC/D practices and intervention followed in the Organisation
CO5	The student will be able to create and reconstruct OC/D intervention and process required to manage the Organisation
CO6	The student will be able to appraise and judge the practical applicability of various OC/D intervention, process and practices to be followed in the Organisation

Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: COMPENSATION AND REWARD MANAGEMENT-22MBAHR306	
CO1	The student will be able to describe and identify the application of Compensation Management in the Organisation
CO2	The student will be able to describe and explain in her/his own words, the relevance and importance of Compensation Management in the Organisation
CO3	The student will be able to apply and solve the workplace problems through application of Compensation Management
CO4	The student will be able to classify and categories different models and approaches of Compensation Management adopted in the Organisation
CO5	The student will be able to formulate and prepare Compensation Management to be adopted in the Organisation
CO6	The student will be able to design and develop an original framework and model in dealing with compensation problems in the organisation.

Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: Introduction to Python, Data and Control Systems-22MBABA303	
CO1	To understand python programming
CO2	To develop Python programs with conditionals and loops
CO3	To define Python functions and call them.
CO4	To use Python data structures – lists, tuples, dictionaries and do with input / output with files in Python.

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Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: EXPLORATORY DATA ANALYSIS FOR BUSINESS-22MBABA304	
CO1	To make students to understand data analysis and visualization process
CO2	To make students to use tools to extract trends from existing data to drive business decisions
CO3	To make students to analyze and to visualize different characteristics of a data set
CO4	To make students to develop summarized reports

Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: BUSINESS ANALYTICS AND INTELLIGENCE-22MBABA305	
CO1	To impart the skills needed to manage database of large scale organization, techniques for data mining.
CO2	To become familiar with the processes needed to develop, report, and analyse business data.
CO3	To provide a comprehensive introduction to various visualization techniques
CO4	To focus on solving problems around Data Processing and Analysis
CO5	To provide a comprehensive introduction to various visualization techniques
CO6	To focus on solving problems around Data Processing and Analysis

Year /SEM:2nd year/3rd SEM	Year of Study:2022-23
Course Name: Marketing, Web and Social Media Analytics-22MBABA306	
CO1	To make students to understand Web marketing and digital marketing concepts
CO2	To make students to apply knowledge of web marketing for data analysis
CO3	To make students to analyze social media like Facebook analytics
CO4	To make students to use statistical tools for data analysis

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Year /SEM:2nd year/4th SEM

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: International Business-22MBA401	
CO1	To explore and offer knowledge on Global Business Environment.
CO2	To explore knowledge on International Institutions involved in global business
CO3	To assist the students to develop a truly Global Perspective.
CO4	To understand the contemporary issues in global business that illustrates the unique challenges faced by managers in the IBE

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: INNOVATION AND DESIGN THINKING-22MBA402	
CO1	To familiarise Design Thinking (DT) and its phases
CO2	To enable the students to become aware of the evolution, concepts & models of Design Thinking
CO3	To enable learners with the context, methods and mindsets pertaining to Design Thinking.
CO4	To equip students to the opportunities to ideate and find solutions by applying DT.

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: STRATEGIC BRAND MANAGEMENT-22MBAMM403	
CO1	To appreciate the relationship between corporate strategy and Brand Management
CO2	To explore the various issues related to Brand Management, brand association, brand identity, brand architecture, leveraging brand assets, brand portfolio management.
CO3	To develop familiarity and competence with the strategies and tactics involved in building,leveraging and defending strong brands in different sectors.

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: INTEGRATED MARKETING COMMUNICATIONS-22MBAMM404	
CO1	To build a comprehensive framework for integrated marketing communications.
CO2	To the study the advertising, publicity, personal selling, direct marketing and sales promotion.
CO3	To enhance knowledge of emerging trends in integrated marketing communications
CO4	To acquaint the students with the latest internet and e-marketing techniques, ethically way of handling business.

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: DIGITAL AND SOCIAL MEDIA MARKETING-22MBAMM405	
CO1	Understand how and why to use digital marketing for multiple goals within a larger marketing and/or media strategy.

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CO2	Understand the major digital marketing channels - online advertising: Digital display, video, mobile, search engine, and social media
CO3	Learn to develop, evaluate, and execute a comprehensive digital marketing strategy and plan
CO4	Explore the latest digital ad technologies
CO5	Learn how to measure digital marketing efforts and calculate ROI

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: BUSINESS MARKETING-22MBAMM406	
CO1	To understand how and why to use digital marketing for multiple goals within a larger marketing and/or media strategy
CO2	To understand the major digital marketing channels - online advertising: Digital display, video, mobile, search engine, and social media
CO3	To develop, evaluate, and execute a comprehensive digital marketing strategy and plan
CO4	To measure digital marketing efforts and calculate ROI
CO5	To explore the latest digital ad technologies

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: Global Financial Management-22MBAFM403	
CO1	To understand the International Financial Environment and the Foreign Exchange market
CO2	To learn hedging and Forex risk management
CO3	To learn the Firm's Exposure to risk in International environment and various theories associated with it.
CO4	Understand the various stages of expansion overseas that multinational corporations utilize in order to benefit from globalization
CO5	Describe the international monetary system and the foreign exchange markets.
CO6	Examine the Balance of Payments (BOP) data and determine its implications for international competition
CO7	Identify the basic philosophies that govern corporate behaviour throughout the world.
CO8	Forecast exchange rates based on the parity conditions that should apply between spot rates, forward rates, inflation rates, and interest rates.
CO9	Evaluate portfolios and apply the capital asset pricing model and other multifactor Models in financial decision making.
CO10	Apply the relevant models and skills in Prediction of corporate failure
CO11	Apply derivatives in financial risk management and apply international finance concepts
CO12	Evaluate mergers and acquisitions
CO13	Undertake corporate restructuring and re-organisation& apply valuation techniques in real estate finance

Year /SEM:2nd year/4th SEM	Year of Study:2022-23

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Course Name: MERGERS ACQUISTIONS AND CORPORATE RESTRUCTURING-22MBAFM404	
CO1	To impart knowledge on theories and rationale of corporate restructuring
CO2	To explain and critically evaluate M & A with its different classifications, strategies, theories, synergy etc
CO3	To evaluate the financial forms of M & A.
CO4	To understand the HR & legal aspects of M & A.
CO5	To use appropriate defensive strategies against hostile takeovers

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: RISK MANAGEMENT AND INSURANCE-22MBAFM405	
CO1	To provide an understanding of different types of risk
CO2	To provide an understanding of the risk identification and measurement
CO3	To give an overview of role of Life Insurance in risk management
CO4	To provide an understanding of general insurance contract

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: INDIRECT TAXATION-22MBAFM406	
CO1	To acquaint the students with basic principles and broad understanding of the Indian Indirect tax laws.
CO2	To enable students to distinguish the difference in concept of forward & reverse charge mechanism, composite & mixed supply and various exemptions under the GST regime
CO3	To enhance the knowledge of students on provisions related to time, place and value of supply.
CO4	To enable the student to understand the process of Registration, input tax credit (ITC) and GST assessment under the GST law.
CO5	To enable the student to understand Customs duty provisions and evaluates import and export goods.

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: CONFLICT & NEGOTIATION MANAGEMENT-22MBAHR403	
CO1	To understand the nature of various dimensions of conflict
CO2	To learn various strategies and techniques to manage conflicts
CO3	To understand the importance and role of negotiation in conflict resolution.
CO4	To understand the importance of cross-cultural and gender dimensions of negotiation

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: Global HRM-22MBAHR404	

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CO1	The student will be able to identify the application of IHRM in managing and developing an organization.
CO2	The student will be able to understand International staffing and Training process
CO3	The student will be able to describe the compensation and performance management systems in an international perspective
CO4	The student will be able to analyse the role of culture in international business
CO5	The student will be able to solve the workplace problems involving International issues
CO6	The student will be able to apply concepts and knowledge about the range of Human resource functions to the deployment of expatriate employees.

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: PERSONAL GROWTH AND INTERPERSONAL EFFECTIVENESS-22MBAHR405	
CO1	The student will be able to describe and Identify the application of various PG and IE framework
CO2	The student will be able to describe and explain in her/his own words, the relevance and importance of various PG and IE to be adopted in the Organisation
CO3	The student will be able to apply and improve the workplace effectiveness through various PG and IE
CO4	The student will be able to classify and categorise different PG and IE practices and to be followed in the Organisation
CO5	The student will be able to create and reconstruct Leadership required to manage the Human Resources in the Organisation
CO6	The student will be able to appraise and judge the practical applicability of various PG and IE practices to be followed in the Organisation

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: STRATEGIC TALENT MANAGEMENT-22MBAHR406	
CO1	To make the students realize the challenges of acquisition and retention of talents for the competitive advantage of the organization
CO2	To develop a conceptual understanding of the management of talents in the competitive environment
CO3	To understand how important is to develop and retain the best talents in the industry
CO4	To understand the concepts of competency and its usage in evaluating a person's work
CO5	To get an idea about different tools in identifying required competencies in a person

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: Machine learning-22MBABA403	

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CO1	To acquaint students with theoretical and practical knowledge on machine learning.
CO2	To make students to apply the concepts of Machine learning
CO3	To make students to understand the technology integration and importance of data analytics
CO4	To make students to analyse using the Machine learning techniques for business decisions

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: HR Analytics-22MBABA404	
CO1	To introduce the student to the theory, concepts, and business application of human resources research, data, metrics, systems, analyses, and reporting
CO2	To develop an understanding of the role and importance of HR analytics, and the ability to track, store, retrieve, analyse and interpret HR data to support decision making
CO3	To aware the challenges human resources analytics for the competitive advantage of the organization.
CO4	To enable students to use applicable benchmarks/metrics to conduct research and statistical analyses related to Human Resource Management

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: BIG DATA-22MBABA405	
CO1	Understand the Big Data Platform and its Use cases
CO2	Provide an overview of Apache Hadoop
CO3	Provide HDFS Concepts and Interfacing with HDFS
CO4	Understand Map Reduce Jobs
CO5	Exposure to Data Analytics with R.
CO6	Apply analytics on Structured, Unstructured Data

Year /SEM:2nd year/4th SEM	Year of Study:2022-23
Course Name: FINANCIAL ANALYTICS-22MBABA406	
CO1	To understand the basic concepts of Data analytics
CO2	To Gain an insight into the decision making under uncertainty circumstances based on results
CO3	To apply the statistical tools in financial analytics for solving business problems
CO4	To equip students with necessary analytical skills using excel and SPSS software

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Course outcomes (COs) 2024 Autonomous Scheme

Year /SEM:1st year/1st SEM

Year /SEM:1st year/1st SEM	Year of Study:2024-25
Course Name: Management and Organization Behaviour P24MBA101	
CO1	Gain practical experience in the field of Management and Organisational Behaviour.
CO2	Acquire the conceptual knowledge of management, various functions of Management and theories in OB.
CO3	Develop management and behavioural models related to attitude, perception, power, politics and conflict in workplace
CO4	Analysing the recent trends in Management and OB models.

Year /SEM:1st year/1st SEM	Year of Study:2024-25
Course Name: Financial Accounting & Reporting P24MBA102	
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:2024-25
Course Name: Economics For Decision Making P24MBA103	
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:1st year/1st SEM	Year of Study:2024-25
Course Name: Business Statistics P24MBA104	
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:2024-25
Course Name: Marketing Management P24MBA105	
CO1	Comprehend the concepts of Marketing Management. L1
CO2	Gain knowledge on consumer behavior and buying process

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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:2024-25
Course Name: Managerial Communication P24MBA106	
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.

Year /SEM:1st year/1st SEM	Year of Study:2024-25
Course Name: Office Application Tools	
CO1	Explain the concepts and techniques of Excel Functions.
CO2	Apply suitable Excel functions and techniques based on the nature of data
CO3	Analyze and interpret the relationship between variables of business data
CO4	Evaluate the situation based on data analysis using Excel function

Year /SEM:1st year/2nd SEM

Year /SEM:1st year/2nd SEM	Year of Study:2024-25
Course Name: HUMAN RESOURCES MANAGEMENT P24MBA201	
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	Identify greater understanding about HR practices in SME's & Service Sector
CO5	Recognize knowledge about the innovation in HRM
CO6	Perceive knowledge about the future trends & information System in HRM

Year /SEM:1st year/2nd SEM	Year of Study:2024-25
Course Name: FINANCIAL MANAGEMENT P24MBA202	
CO1	Understand the basic financial management concepts
CO2	Apply Time Value of Money
CO3	Evaluate long term sources of finance & Cost of Capital.
CO4	Evaluate the investment decisions

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CO5	Analyze the capital structure and dividend decisions
CO6	Estimate working capital requirements

Year /SEM:1st year/2nd SEM	Year of Study:2024-25
Course Name: RESEARCH METHODOLOGY AND IPR P24MBA203	
CO1	Understand various research approaches, techniques and strategies in the appropriate in business.
CO2	Develop necessary critical thinking skills in order to evaluate different research approaches in business.
CO3	Perceived the greater understanding of Sampling techniques and errors in sampling.
CO4	Apply a range of quantitative/ qualitative research techniques to business and day to day management problems.
CO5	Demonstrate knowledge and understanding of data analysis, interpretation and report writing.
CO6	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:2024-25
Course Name: OPERATIONS RESEARCH P24MBA204	
CO1	Understand the Basics of Operations Research and Its Applications
CO2	Formulate Linear Programming Problems (LPP)
CO3	Solve Optimization Problems Using Advanced Techniques
CO4	Apply Decision Theory and Game Theory in Business Decision-Making
CO5	Use Queuing Theory and Simulation Models for Business Analysis
CO6	Apply Network Analysis and Project Management Techniques

Year /SEM:1st year/2nd SEM	Year of Study:2024-25
Course Name: CORPORATE STRATEGY P24MBA205	
CO1	Understand the Concept of Corporate Strategy and its Importance
CO2	Analyze Business Environment and External Factors Affecting Corporate Strategy
CO3	Formulate Corporate Strategies Based on Competitive Advantage and Strategic Positioning
CO4	Evaluate Strategic Options and Implement Strategies
CO5	Understand and Apply Strategic Management Tools for Global Business Strategy
CO6	Assess and Evaluate Strategic Performance and Control Mechanisms

Year /SEM:1st year/2nd SEM	Year of Study:2024-25
Course Name: ENTREPRENEURSHIP DEVELOPMENT P24MBA206	
CO1	Understand the Concept of Entrepreneurship and its Role in Economic Development
CO2	Identify Business Opportunities and Evaluate Feasibility
CO3	Develop a Business Plan for New Ventures
CO4	Understand Funding Options and Financial Management for Entrepreneurs
CO5	Develop Entrepreneurial Skills for Managing and Growing a Startup

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• CO6	Understand the Role of Government and Institutions in Supporting Entrepreneurship

Year /SEM:1st year/2nd SEM	**Year of Study:2024-25**
Course Name: SOCIETAL PROJECT P24PRJ207	

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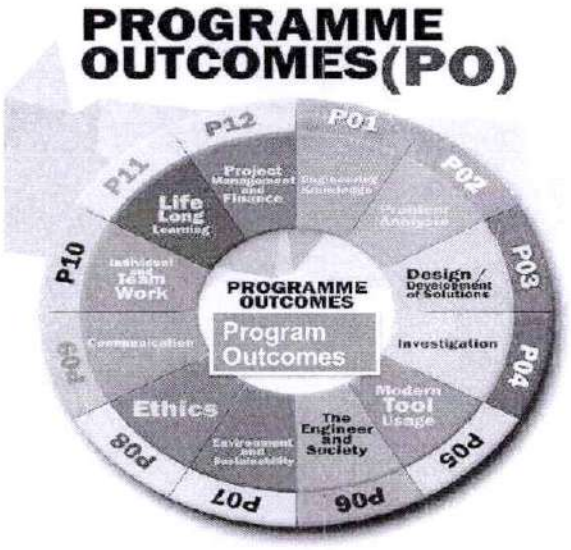
PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES OF ALL DEPARTMENTS– 2024-25

(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.

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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:2024-2025
Course Name: **Mathematical Foundation for Computer Applications – (P24MCA101)**	
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	Identify and list the different applications of discrete mathematical concepts in computer Applications

Year/Sem:1st Year/1st Sem	Year of Study:2024-2025
Course Name: **Operating Systems with LINUX Programming– (P24MCA102)**	
CO1	Understand the basics and essentials of operating system.
CO2	Apply the concepts of Linux to solve computing problems
CO3	Implement advance shell programming concepts.
CO4	Develop interactive scripts using regular expressions in simple and advanced filters.
CO5	Analyze the different memory allocation strategies.

Year/Sem:1st Year/1st Sem	Year of Study:2024-2025
Course Name: **Data Structures and Algorithms – (P24MCA103)**	
CO1	Understand the fundamental Data Structures
CO2	Apply the operational aspects of stacks, Queues and linked list to solve recursive applications.
CO3	Analyze various types of sorting and searching techniques and identify the optimal approach for a given scenario.

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CO4	Summarize the paradigms and approaches used to design and analyze algorithms by categorizing problems based on the popular domains.
CO5	Discuss Divide & conquer algorithms, Greedy Methods and Decrease and Conquer and measure their performance.

Year/Sem:1st Year/1st Sem	Year of Study:2024-2025
Course Name: **Computer Networks – (P24MCA104)**	
CO1	To learn the basic concepts of Data communication and Computer network
CO2	To learn about wireless Transmission.
CO3	To learn about networking and data link layer.
CO4	To study about Network communication.
CO5	To learn the concept of Transport layer.

Year/Sem:1st Year/1st Sem	Year of Study:2024-2025
Course Name: **Software Engineering – (P24MCA105)**	
CO1	Design a software system, component or process to meet desired needs within realistic constraints
CO2	Analyze the differences between plan-driven and Agile development approaches, evaluating their advantages, limitations, and suitability for various project types
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:1st Year/1st Sem	Year of Study:2024-2025
Course Name: **C Programming – (P24MCA109)**	
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:1st Year/1st Sem	Year of Study:2024-2025
Course Name: **Mathematics – I – (P24MCA109)**	
CO1	Understand and convert between binary, octal, and hexadecimal number systems
CO2	Apply propositional logic to create and interpret truth tables
CO3	Perform operations on sets and analyze functions using Venn diagrams
CO4	Conduct matrix operations and solve linear equations using matrices
CO5	Differentiate algebraic functions and apply calculus to find maxima and minima.

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Year/Sem:1st Year/2nd Sem	Year of Study:2024-2025
Course Name: **Artificial Intelligence and Machine Learning – (P24MCA201)**	
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 formalization and state the conclusions that the evaluation supports

Year/Sem:1st Year/2nd Sem	Year of Study:2024-2025
Course Name: **Data Analytics using Python – (P24MCA202)**	
CO1	Understand and comprehend the basics of Python programming.
CO2	Apply knowledge in real time applications
CO3	Apply the Data Pre-processing & Data Wrangling
CO4	Demonstrate the concepts of Web Scraping and Numerical Analysis
CO5	Demonstrate the concepts of data visualization

Year/Sem:1st Year/2nd Sem	Year of Study:2024-2025
Course Name: **Web Technologies – (P24MCA203)**	
CO1	Demonstrate the development of HTML documents using JavaScript and CSS.
CO2	Design and implement user interactive dynamic web based applications.
CO3	Demonstrate applications of Angular and JQuery for the given problem.
CO4	Apply the features JQuery for the given web based problem
CO5	Apply the concept of Angular and Templates

Year/Sem:1st Year/2nd Sem	Year of Study:2024-2025
Course Name: **Oriented Programming through Java – (P24MCA204)**	
CO1	Understand the basics and object oriented concepts of Java
CO2	Recognize methods, classes and inheritance and polymorphism concepts.
CO3	Illustrate the concepts of Packages, Interfaces and Exception
CO4	Apply Multithreading concepts and Collections Framework
CO5	Illustrate the concepts of Files, JDBC, Applets and AWT controls

Year/Sem:1st Year/2nd Sem	Year of Study:2024-2025
Course Name: **Database Management Systems – (P24MCA205)**	
CO1	Identify, analyze and define database objects, enforce integrity constraints on a database using DBMS
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.

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Year/Sem:1st Year/2nd Sem	Year of Study:2024-2025
Course Name: **Data Warehousing & Data Mining – (P24MCAA216)**	
CO1	Assess Raw Input Data and process it to provide suitable input for a range of data mining algorithm.
CO2	Design and Modeling of Data Warehouse.
CO3	Discover interesting pattern from large amount of data
CO4	Able to cluster high dimensional Data
CO5	Apply suitable data mining techniques for various real time applications

Year/Sem:1st Year/2nd Sem	Year of Study:2024-2025
Course Name: **Big Data Analytics – (P24MCAB216)**	
CO1	Apply analytical tools to identify and solve the business problem for a given context.
CO2	Analyze various algorithms for handling large volumes of data.
CO3	Analyze the usage of Map-Reduce techniques for solving big data problems
CO4	Apply the architecture of HDFS and explain functioning of HDFS clusters.
CO5	Carryout experiments on various datasets for analysis/visualization.

Year/Sem:1st Year/2nd Sem	Year of Study:2024-2025
Course Name: **Enterprise Resource Planning – (P24MCAC216)**	
CO1	Analyze the essentials of supply chain management in ERP.
CO2	Analyze the implementation of ERP in the context of business of the different L2 Organization
CO3	Analyze and apply ERP for different business modules for the given problem.
CO4	Analyze the given case study of ERP marketing.
CO5	Analyze the design of ERP with future E-commerce and internet.

Year/Sem:1st Year/2nd Sem	Year of Study:2024-2025
Course Name: **Digital Marketing – (P24MCAD216)**	
CO1	Demonstrate the key concepts related to e-marketing for the given case.
CO2	Demonstrate the use of different electronic media for designing marketing activities.
CO3	Analyze the role of search engines in improving digital marketing.
CO4	Analyze the role of social media marketing in the given problem
CO5	Analyze technical solutions to overcome social media threats

Year/Sem:1st Year/2nd Sem	Year of Study:2024-2025
Course Name: **User Interface Design – (P24MCAE216)**	
CO1	Explain the fundamental concepts of User Interface (UI)
CO2	Outline the UI design process, addressing key challenges, usability considerations, human interaction speeds, and the role of business functions in defining requirements and standards.
CO3	Identify and explain menu structures, navigation schemes, and menu functionalities to design efficient and intuitive system navigation for improved user experience.
CO4	Analyze window characteristics and describe device-based controls for effective UI design in diverse systems.
CO5	Evaluate screen-based controls, and outline testing methods (prototypes and test types) for assessing the effectiveness of interface designs.

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Year/Sem:1st Year/2nd Sem	Year of Study:2024-2025
Course Name: **Cryptography and Network Security – (P24MCAF216)**	
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:2nd Year/3rd Sem	Year of Study:2024-2025
Course Name: **Data Analytics using Python** – (22MCA31)	
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:2nd Year/3rd Sem	Year of Study:2024-2025
Course Name: **Internet of Things**– (22MCA32)	
CO1	Analyze the IoT architecture and design, along with the 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:2nd Year/3rd Sem	Year of Study:2024-2025
Course Name**: Block chain Technology** – (22MCA331)	
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:2nd Year/3rd Sem	Year of Study:2024-2025
Course Name: **Cloud Computing** – (22MCA332)	
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

H.O.D.
Department of M.C.A.
Rajeshwari College of Engineering
Bangalore - 560 074.

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Year/Sem:2nd Year/3rd Sem	Year of Study: 2024-2025
Course Name: **Digital Marketing** – (22MCA333)	
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:2nd Year/3rd Sem	Year of Study: 2024-2025
Course Name: **Object Oriented Modeling and Design** – (22MCA334)	
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:2nd Year/3rd Sem	Year of Study: 2024-2025
Course Name: **NOSQL** – (22MCA335)	
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:2nd Year/3rd Sem	Year of Study: 2024-2025
Course Name: **Advanced Java and J2EE** – (22MCA341)	
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:2nd Year/3rd Sem	Year of Study: 2024-2025
Course Name: **Introduction to Dot Net Framework for Application Development** – (22MCA342)	
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	Design custom interfaces for applications and leverage the available built-in interfaces in building complex applications.
CO4	Illustrate the use of generics and collections in C#

Year/Sem:2nd Year/3rd Sem	Year of Study: 2024-2025
Course Name: **Knowledge Engineering** – (22MCA343)	
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.

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Bangalore - 560 074.

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Year/Sem:2nd Year/3rd Sem	Year of Study: 2024-2025
Course Name: **Software Testing** – (22MCA344)	
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:2nd Year/3rd Sem	Year of Study: 2024-2025
Course Name: **Virtual Reality** – (22MCA345)	
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:2nd Year/4th Sem	Year of Study: 2024-2025
Course Name: **Deep Learning** – (22MCA411)	
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:2nd Year/4th Sem	Year of Study: 2024-2025
Course Name: **Big Data Analytics** – (22MCA412)	
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:2nd Year/4th Sem	Year of Study: 2024-2025
Course Name: **Wireless Ad Hoc Networks** – (22MCA413)	
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:2nd Year/4th Sem	Year of Study: 2024-2025
Course Name: **Software Project Management** – (22MCA414)	
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

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Year/Sem:2nd Year/4th Sem	Year of Study: 2024-2025
Course Name: **Software Defined Networks** – (22MCA415)	
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:2nd Year/4th Sem	Year of Study: 2024-2025
Course Name: **IT Project Management** – (22MCA421)	
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:2nd Year/4th Sem	Year of Study: 2024-2025
Course Name: **Semantic Web & Social Networks** – (22MCA422)	
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: 2024-2025
Course Name: **Fundamentals of Game Design** – (22MCA423)	
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:2nd Year/4th Sem	Year of Study: 2024-2025
Course Name: **Agile Technologies** – (22MCA424)	
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:2nd Year/4th Sem	Year of Study: 2024-2025
Course Name: **SOFTWARE METRICS & QUALITY ASSURANCE** – (22MCA425)	
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

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Department of M.C.A.
Rajeshwari College of Engineering
Bangalore - 560 074.

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Ramohalli Cross

M.Tech (CSE)

1st Semester:

Subject name: Artificial Intelligence **Sub. Code: P24MTC101**

CO	Description
The student will be able to :	
CO1	Explain the foundational concepts of artificial intelligence, including its history, types, and key problem-solving techniques. L2 CO2 L3. L2 CO4
CO2	Apply knowledge representation and reasoning techniques to solve complex problems in AI systems.
CO3	Implement machine learning algorithms and evaluate their performance in real-world applications
CO4	Explore the principles and applications of natural language processing and robotics to enhance human-computer interaction.

Subject name: Data Science and Management **Sub. Code: P24MTC102**

CO	Description
The student will be able to :	
CO1	Explore the foundational concepts of data science, history, significance, and process.
CO2	Apply statistical methods and data analysis techniques to interpret and draw insights from complex datasets
CO3	Implement various machine learning algorithms and assess their performance using appropriate evaluation metrics in real-world scenarios.
CO4	Utilize data visualization tools and techniques to effectively communicate findings and insights to diverse audiences.

Subject name: Data Structures & Algorithms for Problem Solving **Sub. Code: P24MTC103**

CO	Description
The student will be able to :	
CO1	Analyze and apply fundamental data structures and algorithms to solve complex computational problems effectively
CO2	Evaluate and implement various searching, sorting to optimize algorithm performance
CO3	Design and analyze advanced tree and graph algorithms, including balanced search trees and graph traversal methods, to address real-world applications

Subject name: Advanced Software Engineering **Sub. Code: P24MTC104**

CO	Description
The student will be able to :	
CO1	Apply Object-Oriented Software Engineering approach in every aspect of software project.
CO2	Adapt appropriate Object-Oriented design aspects in the development process
CO3	Adapt the concept and tools related to software configuration management.

Dr. D. KIRUBHA
Head of the Department,
Computer Science and Engineering,
Rajarajeswari College of Engineering,
Bangalore - 560 074.

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Subject name: Internet of Things **Sub. Code: P24MTC105**

CO	Description
The student will be able to :	
CO1	Choose appropriate schemes for the applications of IOT in real time scenarios
CO2	Manage the Internet resources through different protocols used in each layer
CO3	Compare various protocols and algorithms in different layers that facilitate effective communication mechanisms
CO4	Identify how IoT differs from traditional data collection systems

Subject name: Algorithms & AI Lab **Sub. Code: P24MTC106**

CO	Description
The student will be able to :	
CO1	Implement and demonstrate AI algorithms.
CO2	Evaluate different algorithms.

2nd Semester:

Subject name: Advanced Operating System **Sub. Code: P24SCS201**

CO	Description
The student will be able to :	
CO1	Analyze the characteristics of operating systems for multiprocessor and multicomputer architectures.
CO2	Understand and address the challenges related to designing operating systems and their implications.
CO3	Explore the latest trends in developing mobile operating systems and evaluate their impact on performance.

Subject name: Advances in Computer Networks **Sub. Code: P24SCS202**

CO	Description
The student will be able to :	
CO1	Identify the vulnerabilities in any computing system and hence be able to design a security solution.
CO2	Identify the security issues in the network and resolve it.
CO3	Analyze security mechanisms using rigorous approaches, including theoretical.
CO4	Apply various protocols for network security to protect against the threats in the networks

Subject name: Network Programming **Sub. Code: P24SCS203**

CO	Description
The student will be able to :	
CO1	Explain the concept of Networking and Transport Layer: TCP, UDP and SCTP.
CO2	Illustrate the working of Sockets

Dr. D. KIRUBHA
Head of the Department,
Computer Science and Engineering,
Rajarajeswari College of Engineering,
Bangalore - 560 074

Principal
RAJARAJESWARI
COLLEGE OF ENGINEERING
Kambohalli Cross, Bengaluru-7

CO3	Demonstrate the Daemon Processes and No blocking
CO4	Explain the IOCtl operations- socket SAD

Subject name: Deep Learning **Sub. Code: P24SCSC214**

CO	Description
The student will be able to :	
CO1	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
CO2	Implement deep learning algorithms and solve real-world problems.
CO3	Execute performance metrics of deep learning Techniques
CO4	Compare modeling aspects of various neural network architectures.

Subject name: Software Project Planning and Management **Sub. Code: P24SCSC215**

CO	Description
The student will be able to :	
CO1	Identify the resources required for a project and to produce a work plan and resource schedule
CO2	Monitor the progress of a project and to assess the risk of slippage, revising targets counteract drift
CO3	Use appropriate metrics to management the software development outcome

Subject name: Mini Project with Seminar **Sub. Code: P24SCS206**

CO	Description
The student will be able to :	
CO1	Present the mini-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 ora l 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.

Subject name: Network Programming Laboratory **Sub. Code: P24SCS207**

CO	Description
The student will be able to :	
CO1	Understanding of the working principle of Socket programming
CO2	Familiarization with the OPNET toolkit

Subject name: Skill Enhancement for Research Excellence-1 **Sub. Code: P24SCS208**

CO	Description
The student will be able to :	
CO1	Produce High-Quality Research Papers: Create research papers that meet international conference and peer-reviewed journal standards
CO2	Identify Suitable Journals: Effectively select appropriate journals for publication based on research scope and impact.

Dr. D. KIRUBHA
Head of the Department,
Computer Science and Engineering,
Rajarajeswari College of Engineering
Bangalore - 560 074

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Kamohalli Cross, Bengaluru-7

CO3	Proficiency in Writing: Demonstrate skill in writing and structuring research papers according to academic conventions.
CO4	Engage in Peer Review: Actively participate in the peer review process by providing and receiving constructive feedback.
CO5	Develop Presentation Skills: Acquire skills for presenting research at conferences, including crafting effective abstracts and posters.
CO6	Understand Ethical Considerations: Cultivate a strong understanding of ethical issues in research and publication practices.
CO7	Utilize Citation Management Tools: Use citation management tools to organize references and ensure proper attribution.
CO8	Respond to Reviewer Comments: Refine the ability to address reviewer comments and revise manuscripts effectively.

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Dr. D. KIRUBHA
Head of the Department,
Computer Science and Engineering,
Rajarajeswari College of Engineering,
Bangalore - 560 074.

Principal
RAJARAJESWARI
COLLEGE OF ENGINEERING
Kamohalli Cross, Bengaluru-74