

COURSE OUTCOMES

Department of Computer Science and Engineering

YEAR	SUBJECT CODE	SUBJECT NAME	COURSE OUTCOME
2023-2024 3rd Sem	BCS301	Mathematics for Computer Science	1. Explain the basic concepts of probability, random variables, probability distribution 2. Apply suitable probability distribution models for the given scenario. 3. Apply the notion of a discrete-time Markov chain and n-step transition probabilities to solve the given problem 4. Use statistical methodology and tools in the engineering problem-solving process. 5. Compute the confidence intervals for the mean of the population. 6. Apply the ANOVA test related to engineering problems.
	BCS302	Digital Design and Computer Organization	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.
	BCS303	OPERATING SYSTEMS	CO 1. Explain the structure and functionality of operating system CO 2. Apply appropriate CPU scheduling algorithms for the given problem. CO 3. Analyse the various techniques for process synchronization and deadlock handling. CO 4. Apply the various techniques for memory management CO 5. Explain file and secondary storage management strategies. CO 6. Describe the need for information protection mechanisms
	BCS304	DATA STRUCTURES AND APPLICATIONS	CO 1. Explain different data structures and their applications. CO 2. Apply Arrays, Stacks and Queue data structures to solve the given problems. CO 3. Use the concept of linked list in problem solving. CO 4. Develop solutions using trees and graphs to model the real-world problem. CO 5. Explain the advanced Data Structures concepts such as Hashing Techniques and Optimal Binary Search Trees.
	BCSL305	DATA STRUCTURES LABORATORY	• Analyze various linear and non-linear data structures • Demonstrate the working nature of different types of data structures and their applications • Use appropriate searching and sorting algorithms for the give scenario. • Apply the appropriate data structure for solving real world problems
	BCS306B	OBJECT ORIENTED PROGRAMMING with C++	1. Illustrate the basic concepts of object-oriented programming. 2. Design appropriate classes for the given real world scenario. 3. Apply the knowledge of compile-time / run-time polymorphism to solve the given problem 4. Use the knowledge of inheritance for developing optimized solutions 5. Apply the concepts of templates and exception handling for the given problem 6. Use the concepts of input output streams for file operations
	BSCK307	Social Connect & Responsibility	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.
	BCS358A	Data Analytics with Excel	• Use advanced functions and productivity tools to assist in developing worksheets. • Manipulate data lists using Outline and PivotTables. • Use Consolidation to summarise and report results from multiple worksheets. • Apply Macros and Autofilter to solve the given real world scenario.
	BPEK359	Physical Education (PE) (Sports and Athletics)	

2023-2024 4 th Sem	BCS401	Analysis & Design of Algorithms	1. Apply asymptotic notational method to analyze the performance of the algorithms in terms of time complexity. 2. Demonstrate divide & conquer approaches and decrease & conquer approaches to solve computational problems. 3. Make use of transform & conquer and dynamic programming design approaches to solve the given real world or complex computational problems. 4. Apply greedy and input enhancement methods to solve graph & string based computational problems. 5. Analyse various classes (P, NP and NP Complete) of problems 6. Illustrate backtracking, branch & bound and approximation methods.
	BCS402	MICROCONTROLLERS	● Explain the ARM Architectural features and Instructions. ● Develop programs using ARM instruction set for an ARM Microcontroller. ● Explain C-Compiler Optimizations and portability issues in ARM Microcontroller. ● Apply the concepts of Exceptions and Interrupt handling mechanisms in developing applications. ● Demonstrate the role of Cache management and Firmware in Microcontrollers.
	BCS403	DATABASE MANAGEMENT SYSTEM	● Describe the basic elements of a relational database management system ● Design entity relationship for the given scenario. ● Apply various Structured Query Language (SQL) statements for database manipulation. ● Analyse various normalization forms for the given application. ● Develop database applications for the given real world problem. ● Understand the concepts related to NoSQL databases.
	BCSL404	Analysis & Design of Algorithms Lab	1. Develop programs to solve computational problems using suitable algorithm design strategy. 2. Compare algorithm design strategies by developing equivalent programs and observing running times for analysis (Empirical). 3. Make use of suitable integrated development tools to develop programs 4. Choose appropriate algorithm design techniques to develop solution to the computational and complex problems. 5. Demonstrate and present the development of program, its execution and running time(s) and record the results/inferences.
	BCS405A	DISCRETE MATHEMATICAL STRUCTURES	1. Apply concepts of logical reasoning and mathematical proof techniques in proving theorems and statements. 2. Demonstrate the application of discrete structures in different fields of computer science. 3. Apply the basic concepts of relations, functions and partially ordered sets for computer representations. 4. Solve problems involving recurrence relations and generating functions. 5. Illustrate the fundamental principles of Algebraic structures with the problems related to computer science & engineering.
	BCSL456D	Technical Writing using LaTeX	● Apply basic LaTeX command to develop simple document ● Develop LaTeX script to present the tables and figures in the document ● Illustrate LaTeX script to present theorems and mathematical equations in the document ● Develop programs to generate the complete report with citations and a bibliography ● Illustrate the use of Tikz and algorithm libraries to design graphics and algorithms in the document
	BBOC407	Biology For Computer Engineers	1. Elucidate the basic biological concepts via relevant industrial applications and case studies. 2. Evaluate the principles of design and development, for exploring novel bioengineering projects. 3. Corroborate the concepts of biomimetics for specific requirements. 4. Think critically towards exploring innovative biobased solutions for socially relevant problems.
	BUHK408	Universal human values course	1. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. 2. They would have better critical ability. 3. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). 5. 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

2023-2024 5th Sem	21CS51	AUTOMATA THEORY AND COMPILER DESIGN	CO 1. Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation CO 2. Design and develop lexical analyzers, parsers and code generators CO 3. Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers. CO 4. Acquire fundamental understanding of the structure of a Compiler and Apply concepts automata theory and Theory of Computation to design Compilers CO 5. Design computations models for problems in Automata theory and adaptation of such model in the field of compilers
	21CS52	COMPUTER NETWORKS	CO 1. Learn the basic needs of communication system. CO 2. Interpret the communication challenges and its solution. CO 3. Identify and organize the communication system network components CO 4. Design communication networks for user requirements
	21CS53	DATABASE MANAGEMENT SYSTEMS	CO 1. Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS CO 2. Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of query evaluation. CO 3. Design and build simple database systems and relate the concept of transaction, concurrency control and recovery in database CO 4. Develop application to interact with databases, relational algebra expression. CO 5. Develop applications using tuple and domain relation expression from queries.
	21CS54	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	CO 1. Apply the knowledge of searching and reasoning techniques for different applications. CO 2. Have a good understanding of machine learning in relation to other fields and fundamental issues and challenges of machine learning. CO 3. Apply the knowledge of classification algorithms on various dataset and compare results CO 4. Model the neuron and Neural Network, and to analyze ANN learning and its applications. CO 5. Identifying the suitable clustering algorithm for different pattern
	21CSL55	DATABASE MANAGEMENT SYSTEM LABORATORY WITH MINI PROJECT	CO 1. Create, Update and query on the database. CO 2. Demonstrate the working of different concepts of DBMS CO 3. Implement, analyze and evaluate the project developed for an application
	21RMI56	Research Methodology & Intellectual Property Rights	CO1. To know the meaning of engineering research. CO2. To know the procedure of Literature Review and Technical Reading. CO3. To know the fundamentals of patent laws and drafting procedure. CO 4. Understanding the copyright laws and subject matters of copyrights and designs CO5. Understanding the basic principles of design rights.
	21CIV57	Environmental Studies	CO1: Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale, CO2: Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment. CO3: Demonstrate ecology knowledge of a complex relationship between biotic and a biotic components. CO4: Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.
	21CSL582	C# and .Net Framework	1. Develop programs involving basic features of C# programming language 2. Make use of exception handling features to safeguard program against runtime anomalies 3. Apply concepts of OOP in developing solutions to problems 4. Develop programs to illustrate handling of text files 5. Make use of modern tools to develop C# programs and applications

2023-2024 6th Sem	21CS61	SOFTWARE ENGINEERING & PROJECT MANAGEMENT	CO 1. Understand the activities involved in software engineering and analyze the role of various process models CO 2. Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques CO 3. Describe various software testing methods and to understand the importance of agile methodology and DevOps CO 4. Illustrate the role of project planning and quality management in software development CO 5. Understand the importance of activity planning and different planning models
	21CS62	FULLSTACK DEVELOPMENT	CO 1. Understand the working of MVT based full stack web development with Django. CO 2. Designing of Models and Forms for rapid development of web pages. CO 3. Analyze the role of Template Inheritance and Generic views for developing full stack web applications. CO 4. Apply the Django framework libraries to render nonHTML contents like CSV and PDF. CO 5. Perform jQuery based AJAX integration to Django Apps to build responsive full stack web applications,
	21CS63	COMPUTER GRAPHICS AND FUNDAMENTALS OF IMAGE PROCESSING	CO 1. Construct geometric objects using Computer Graphics principles and OpenGL APIs. CO 2. Use OpenGL APIs and related mathematics for 2D and 3D geometric Operations on the objects. CO 3. Design GUI with necessary techniques required to animate the created objects CO 4. Apply OpenCV for developing Image processing applications. CO 5. Apply Image segmentation techniques along with programming, using OpenCV, for developing simple applications.
	21CS644	DATA SCIENCE AND VISUALIZATION	CO 1. Understand the data in different forms CO 2. Apply different techniques to Explore Data Analysis and the Data Science Process CO 3. Analyze feature selection algorithms & design a recommender system. CO 4. Evaluate data visualization tools and libraries and plot graphs. CO 5. Develop different charts and include mathematical expressions
	21ME651	PROJECT MANAGEMENT	1.Understand the selection, prioritization and initiation of individual projects and strategic role of project management. 2.Understand the work breakdown structure by integrating it with organization. 3. Understand the scheduling and uncertainty in projects. 4. Understand risk management planning using project quality tools. 5.Understand the activities like purchasing, acquisitions, contracting, partnering and collaborations related to performing projects. 6. Determine project progress and results through balanced scorecard approach 7. Draw the network diagram to calculate the duration of the project and reduce it using crashing
	21CSL66	COMPUTER GRAPHICS AND IMAGE PROCESSING LABORATORY	CO 1: Use openGL /OpenCV for the development of mini Projects. CO 2: Analyze the necessity mathematics and design required to demonstrate basic geometric transformation techniques. CO 3: Demonstrate the ability to design and develop input interactive techniques. CO 4: Apply the concepts to Develop user friendly applications using Graphics and IP concepts
2023	18CS71	Artificial Intelligence and Machine Learning	1.Appaise the theory of Artificial intelligence and Machine Learning. 2. Illustrate the working of AI and ML Algorithms. 3.Demonstrate the applications of AI and ML.
	18CS72	Big Data Analytics	1.Understand fundamentals of Big Data analytics. 2. Investigate Hadoop framework and Hadoop Distributed File system. 3. Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data. 4. Demonstrate the MapReduce programming model to process the big data along with Hadoop tools. 5. Use Machine Learning algorithms for real world big data. 6. Analyze web contents and Social Networks to provide analytics with relevant visualization tools
	18CS734	User Interface Design	1.Design the User Interface, design, menu creation, windows creation and connection between menus and windows

2023-2024 7th Sem	18CS742	Network management	1. Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets. 2. Apply network management standards to manage practical networks 3..Formulate possible approaches for managing OSI network model. 4..Use on SNMP for managing the network 5. Use RMON for monitoring the behavior of the network 6. Identify the various components of network and formulate the scheme for the managing them
	18CV753	Environmental Protection and Management	1.Appreciate the elements of Corporate Environmental Management systems complying to international environmental management system standards. 2. Lead pollution prevention assessment team and implement waste minimization options. 3. Develop, Implement, maintain and Audit Environmental Management systems for Organizations
	18CSL76	Artificial Intelligence and Machine Learning Laboratory	1.Implement and demonstrate AI and ML algorithms. 2. Evaluate different algorithms
2023-2024 8th Sem	18CS81	Internet of Things	Interpret the impact and challenges posed by IoT networks leading to new architectural models. 1. Compare and contrast the deployment of smart objects and the technologies to connect them to network. 2.Appraise the role of IoT protocols for efficient network communication. 3.Elaborate the need for Data Analytics and Security in IoT. 4. Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.
	18CS822	Storage Area Networks	1.Identify key challenges in managing information and analyze different storage networking technologies and virtualization 2. Explain components and the implementation of NAS 3. Describe CAS architecture and types of archives and forms of virtualization 4. Illustrate the storage infrastructure and management activities
Department of Information Science and Engineering			
Year	Subject Code	Subject	Co'S
2023-24 3rd SEM	BCS301	Mathematics for Computer Science	1. Explain the basic concepts of probability, random variables, probability distribution 2. Apply suitable probability distribution models for the given scenario. 3. Apply the notion of a discrete-time Markov chain and n-step transition probabilities to solve the given problem 4. Use statistical methodology and tools in the engineering problem-solving process. 5. Compute the confidence intervals for the mean of the population. 6. Apply the ANOVA test related to engineering problems.
	BCS302	Digital Design and Computer Organization	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.
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	BCS304	DATA STRUCTURES AND APPLICATIONS	CO 1. Explain different data structures and their applications. CO 2. Apply Arrays, Stacks and Queue data structures to solve the given problems. CO 3. Use the concept of linked list in problem solving. CO 4. Develop solutions using trees and graphs to model the real-world problem. CO 5. Explain the advanced Data Structures concepts such as Hashing Techniques and Optimal Binary Search Trees.
	BCSL305	DATA STRUCTURES LABORATORY	● Analyze various linear and non-linear data structures ● Demonstrate the working nature of different types of data structures and their applications ● Use appropriate searching and sorting algorithms for the give scenario. ● Apply the appropriate data structure for solving real world problems

	BCS306A	Object Oriented Programming with JAVA	1. Demonstrate proficiency in writing simple programs involving branching and looping structures. 2. Design a class involving data members and methods for the given scenario. 3. Apply the concepts of inheritance and interfaces in solving real world problems. 4. Use the concept of packages and exception handling in solving complex problem 5. Apply concepts of multithreading, autoboxing and enumerations in program development
	BCS358A	Data Analytics with Excel	• Use advanced functions and productivity tools to assist in developing worksheets. • Manipulate data lists using Outline and PivotTables. • Use Consolidation to summarise and report results from multiple worksheets. • Apply Macros and Autofilter to solve the given real world scenario.
Year	Subject Code	Subject	Co'S
2023-24 4th SEM	BCS401	Analysis & Design of Algorithms	1. Apply asymptotic notational method to analyze the performance of the algorithms in terms of time complexity. 2. Demonstrate divide & conquer approaches and decrease & conquer approaches to solve computational problems. 3. Make use of transform & conquer and dynamic programming design approaches to solve the given real world or complex computational problems. 4. Apply greedy and input enhancement methods to solve graph & string based computational problems. 5. Analyse various classes (P,NP and NP Complete) of problems 6. Illustrate backtracking, branch & bound and approximation methods.
	BIS402	Advanced Java	CO 1. Apply appropriate collection class/interface to solve the given problem CO 2. Demonstrate the concepts of String operations in Java CO 3. Apply the concepts of Swings to build Java applications CO 4. Develop web based applications using Java servlets and JSP CO 5. Use JDBC to build database applications
	BCS403	DATABASE MANAGEMENT SYSTEM	• Describe the basic elements of a relational database management system • Design entity relationship for the given scenario. • Apply various Structured Query Language (SQL) statements for database manipulation. • Analyse various normalization forms for the given application. • Develop database applications for the given real world problem. • Understand the concepts related to NoSQL databases.
	BCSL404	Analysis & Design of Algorithms Lab	1. Develop programs to solve computational problems using suitable algorithm design strategy. 2. Compare algorithm design strategies by developing equivalent programs and observing running times for analysis (Empirical). 3. Make use of suitable integrated development tools to develop programs 4. Choose appropriate algorithm design techniques to develop solution to the computational and complex problems. 5. Demonstrate and present the development of program, its execution and running time(s) and record the results/inferences.
	BCS405A	DISCRETE MATHEMATICAL STRUCTURES	1. Apply concepts of logical reasoning and mathematical proof techniques in proving theorems and statements. 2. Demonstrate the application of discrete structures in different fields of computer science. 3. Apply the basic concepts of relations, functions and partially ordered sets for computer representations. 4. Solve problems involving recurrence relations and generating functions. 5. Illustrate the fundamental principles of Algebraic structures with the problems related to computer science & engineering.
	BCSL456D	Technical Writing using LaTeX	• Apply basic LaTeX command to develop simple document • Develop LaTeX script to present the tables and figures in the document • Illustrate LaTeX script to present theorems and mathematical equations in the document • Develop programs to generate the complete report with citations and a bibliography • Illustrate the use of Tikz and algorithm libraries to design graphics and algorithms in the document
	BBOC407	Biology For Computer Engineers	1. Elucidate the basic biological concepts via relevant industrial applications and case studies. 2. Evaluate the principles of design and development, for exploring novel bioengineering projects. 3. Corroborate the concepts of biomimetics for specific requirements. 4. Think critically towards exploring innovative biobased solutions for socially relevant problems.

	BUHK408	Universal human values course	1.They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. 2 They would have better critical ability. 3. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). 5. 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	Subject Code	Subject	Co'S
2023-24 5th SEM	21CS51	AUTOMATA THEORY AND COMPILER DESIGN	CO 1. Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation CO 2. Design and develop lexical analyzers, parsers and code generators CO 3. Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers. CO 4. Acquire fundamental understanding of the structure of a Compiler and Apply concepts automata theory and Theory of Computation to design Compilers CO 5. Design computations models for problems in Automata theory and adaptation of such model in the field of compilers
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	21CS53	DATABASE MANAGEMENT SYSTEMS	CO 1. Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS CO 2. Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of query evaluation. CO 3. Design and build simple database systems and relate the concept of transaction, concurrency control and recovery in database CO 4. Develop application to interact with databases, relational algebra expression. CO 5. Develop applications using tuple and domain relation expression from queries.
	21CS54	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	CO 1. Apply the knowledge of searching and reasoning techniques for different applications. CO 2. Have a good understanding of machine learning in relation to other fields and fundamental issues and challenges of machine learning. CO 3. Apply the knowledge of classification algorithms on various dataset and compare results CO 4. Model the neuron and Neural Network, and to analyze ANN learning and its applications. CO 5. Identifying the suitable clustering algorithm for different pattern
	21CSL55	DATABASE MANAGEMENT SYSTEM LABORATORY WITH MINI PROJECT	CO 1. Create, Update and query on the database. CO 2. Demonstrate the working of different concepts of DBMS CO 3. Implement, analyze and evaluate the project developed for an application
	21RMI56	Research Methodology & Intellectual Property Rights	CO1. To know the meaning of engineering research. CO2. To know the procedure of Literature Review and Technical Reading. CO3. To know the fundamentals of patent laws and drafting procedure. CO 4. Understanding the copyright laws and subject matters of copyrights and designs CO5. Understanding the basic principles of design rights.
	21CIV57	Environmental Studies	CO1: Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale, CO2: Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment. CO3: Demonstrate ecology knowledge of a complex relationship between biotic and a biotic components. CO4: Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.

	21CSL582	C# and .Net Framework	1. Develop programs involving basic features of C# programming language 2. Make use of exception handling features to safeguard program against runtime anomalies 3. Apply concepts of OOP in developing solutions to problems 4. Develop programs to illustrate handling of text files 5. Make use of modern tools to develop C# programs and applications
2023-24 6th SEM	21CS61	SOFTWARE ENGINEERING & PROJECT MANAGEMENT	CO 1. Understand the activities involved in software engineering and analyze the role of various process models CO 2. Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques CO 3. Describe various software testing methods and to understand the importance of agile methodology and DevOps CO 4. Illustrate the role of project planning and quality management in software development CO 5. Understand the importance of activity planning and different planning models
	21CS62	FULLSTACK DEVELOPMENT	CO 1. Understand the working of MVT based full stack web development with Django. CO 2. Designing of Models and Forms for rapid development of web pages. CO 3. Analyze the role of Template Inheritance and Generic views for developing full stack web applications. CO 4. Apply the Django framework libraries to render nonHTML contents like CSV and PDF. CO 5. Perform jQuery based AJAX integration to Django Apps to build responsive full stack web applications,
	21IS63	SOFTWARE TESTING	CO 1. Explain the significance of software testing and quality assurance in software development CO 2. Apply the concepts of software testing to assess the most appropriate testing method. CO 3. Analyze the importance of testing in software development. CO 4. Evaluate the suitable testing model to derive test cases for any given software CO 5. Develop appropriate document for the software artefact
	21IS643	DATA MINING AND DATA WAREHOUSING	CO 1. Understand warehousing architectures and tools for systematically organizing large database and use their data to make strategic decisions. CO 2. Apply KDD process for finding interesting pattern from warehouse. CO 3. Analyze the kinds of patterns that can be discovered by association rule mining. CO 4. Evaluate interesting patterns from large amounts of data to analyze for predictions and classification. CO 5. Design select suitable methods for data mining and analysis
	21ME651	PROJECT MANAGEMENT	1. Understand the selection, prioritization and initiation of individual projects and strategic role of project management. 2. Understand the work breakdown structure by integrating it with organization. 3. Understand the scheduling and uncertainty in projects. 4. Understand risk management planning using project quality tools. 5. Understand the activities like purchasing, acquisitions, contracting, partnering and collaborations related to performing projects. 6. Determine project progress and results through balanced scorecard approach 7. Draw the network diagram to calculate the duration of the project and reduce it using crashing
	21ISL66	SOFTWARE TESTING LABORATORY	CO 1. List out the requirements for the given problem and develop test cases for any given problem . CO 2. Design and implement the solution for given problem and to design flow graph CO 3. Use Eclipse/NetBeans IDE and testing tools to design, develop, debug the Project and create appropriate document for the software artifact. CO 4. Use the appropriate functional testing strategies. Compare the different testing techniques. CO 5. Classify and Compare the problems according to a suitable testing model applying the test coverage metrics.
	21ISMP67	Mini Project	
	21INT68	Innovation/Entrepreneurship /Societal Internship	
Year	Subject Code	Subject	Co'S
	18CS71	Artificial Intelligence and Machine Learning	1.Appaise the theory of Artificial intelligence and Machine Learning. 2. Illustrate the working of AI and ML Algorithms. 3.Demonstrate the applications of AI and ML.

2023-24 7th SEM	18CS72	Big Data Analytics	1.Understand fundamentals of Big Data analytics. 2. Investigate Hadoop framework and Hadoop Distributed File system. 3. Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data. 4. Demonstrate the MapReduce programming model to process the big data along with Hadoop tools. 5. Use Machine Learning algorithms for real world big data. 6. Analyze web contents and Social Networks to provide analytics with relevant visualization tools
	18CS734	User Interface Design	1.Design the User Interface, design, menu creation, windows creation and connection between menus and windows
	18CS742	Network management	1. Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets. 2. Apply network management standards to manage practical networks 3..Formulate possible approaches for managing OSI network model. 4..Use on SNMP for managing the network 5. Use RMON for monitoring the behavior of the network 6. Identify the various components of network and formulate the scheme for the managing them
	18CV753	Environmental Protection and Management	1.Appreciate the elements of Corporate Environmental Management systems complying to international environmental management system standards. 2. Lead pollution prevention assessment team and implement waste minimization options. 3. Develop, Implement, maintain and Audit Environmental Management systems for Organizations
	18CSL76	Artificial Intelligence and Machine Learning Laboratory	1.Implement and demonstrate AI and ML algorithms. 2. Evaluate different algorithms
Year	Subject Code	Subject	Co'S
2023-24 8th SEM	18CS81	Internet of Things	- Interpret the impact and challenges posed by IoT networks leading to new architectural models. 1. Compare and contrast the deployment of smart objects and the technologies to connect them to network. 2.Appraise the role of IoT protocols for efficient network communication. 3.Elaborate the need for Data Analytics and Security in IoT. 4. Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.
	18CS822	Storage Area Networks	1.Identify key challenges in managing information and analyze different storage networking technologies and virtualization 2. Explain components and the implementation of NAS 3. Describe CAS architecture and types of archives and forms of virtualization 4. Illustrate the storage infrastructure and management activities
Department of Electronics and Communication Engineering			
Year	Subject Code	Subject	Co'S
2023-2024 (3rd SEM)	BMATEC301	AV Mathematics-III for EC Engineering	1. Demonstrate the Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing, and field theory. 2. To use Fourier transforms to analyze problems involving continuous-time signals 3. To apply Z-Transform techniques to solve difference equations 4. Understand that physical systems can be described by differential equations and solve such equations 5. Make use of correlation and regression analysis to fit a suitable mathematical model for statistical data
	BEC302	Digital System Design using Verilog	1. Simplify Boolean functions using K-map and Quine-McCluskey minimization technique. 2. Analyze and design for combinational logic circuits. 3. Analyze the concepts of Flip Flops(SR, D,T and JK) and to design the synchronous sequential circuits using Flip Flops. 4. Model Combinational circuits (adders, subtractors, multiplexers) and sequential circuits using Verilog descriptions
	BEC303	Electronic Principles and Circuits	1. Understand the characteristics of BJTs and FETs for switching and amplifier circuits. 2. Design and analyze amplifiers and oscillators with different circuit configurations and biasing conditions. 3. Understand the feedback topologies and approximations in the design of amplifiers and oscillators. 4. Design of circuits using linear ICs for wide range applications such as ADC, DAC, filters and timers. 5. Understand the power electronic device components and its functions for basic power electronic circuits.

	BEC304	Network Analysis	1. Determine currents and voltages using source transformation/ source shifting/ mesh/ nodal analysis and reduce given network using star- delta transformation. 2. Solve problems by applying Network Theorems and electrical laws to reduce circuit complexities and to arrive at feasible solutions. 3. Analyse the circuit parameters during switching transients and apply Laplace transform to solve the given network 4. Evaluate the frequency response for resonant circuits and the network parameters for two port networks
	BECL305	Analog and Digital Systems Design Laboratory	1. Design and analyze the BJT/FET amplifier and oscillator circuits. 2. Design and test Opamp circuits to realize the mathematical computations, DAC and precision rectifiers. 3. Design and test the combinational logic circuits for the given specifications. 4. Test the sequential logic circuits for the given functionality. 5. Demonstrate the basic circuit experiments using 555 timer.
Year	Subject Code	Subject	Co'S
2023-24 (4th SEM)	BEC401	ELECTROMAGNETIC THEORY	1. Evaluate problems on electrostatic force, electric field due to point, linear, volume charges by applying conventional methods and charge in a volume. 2. Apply Gauss law to evaluate Electric fields due to different charge distributions and Volume Charge distribution by using Divergence Theorem. 3. Determine potential and energy with respect to point charge and capacitance using Laplace equation and Apply Biot-Savart's and Ampere's laws for evaluating Magnetic field for different current configurations 4. Calculate magnetic force, potential energy and Magnetization with respect to magnetic materials and voltage induced in electric circuits. 5. 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
	BEC402	PRINCIPLES OF COMMUNICATION SYSTEMS	1. Understand the principles of analog communication systems and noise modelling. 2. Identify the schemes for analog modulation and demodulation and compare their performance. 3. Design of PCM systems through the processes sampling, quantization and encoding. 4. Describe the ideal condition, practical considerations of the signal representation for baseband transmission of digital signals. 5. Identify and associate the random variables and random process in Communication system design.
	BEC403	Control Systems	1. Deduce transfer function of a given physical system, from differential equation representation or Block Diagram representation and SFG representation. 2. Calculate time response specifications and analyse the stability of the system. 3. Draw and analyse the effect of gain on system behaviour using root loci. 4. Perform frequency response Analysis and find the stability of the system. 5. Represent State model of the system and find the time response of the system.
	BECL404	Communication Laboratory	1. Illustrate the AM generation and detection using suitable electronic circuits. 2. Design of FM circuits for modulation, demodulation and noise suppression. 3. Design and test the sampling, Multiplexing and pulse modulation techniques using electronic hardware. 4. Design and Demonstrate the electronic circuits used for RF transmitters and receivers.
Year	Subject Code	Subject	Co'S
2023-2024 5th Sem	21EC51	Digital Communication	1. Analyze different digital modulation techniques and choose the appropriate modulation technique for the given specifications. 2. Test and validate symbol processing and performance parameters at the receiver under ideal and corrupted bandlimited channels. 3. Differentiate various spread spectrum schemes and compute the performance parameters of communication system. 4. Apply the fundamentals of information theory and perform source coding for given message 5. Apply different encoding and decoding techniques with error Detection and Correction
	21EC52	Computer Organization & ARM Microcontrollers	1. Explain the basic organization of a computer system. 2. Demonstrate functioning of different sub systems, such as processor, Input/output, and memory. 3. Describe the architectural features and instructions of 32-bit microcontroller ARM Cortex M3. 4. Apply the knowledge gained for Programming ARM Cortex M3 for different applications.
	21EC53	Computer Communication Networks	1. Understand the concepts of networking thoroughly. 2. Identify the protocols and services of different layers. 3. Distinguish the basic network configurations and standards associated with each network. 4. Discuss and analyse the various applications that can be implemented on networks.

	21ECL55	Communication Lab II	1. Design and test the digital modulation circuits and display the waveforms. 2. To Implement the source coding algorithm using C/C++/ MATLAB code. 3. To Implement the Error Control coding algorithms using C/C++/ MATLAB code. 4. Illustrate the operations of networking concepts and protocols using C programming and network simulators.
Year	Subject Code	Subject	Co'S
	21EC61	TECHNOLOGICAL INNOVATION MANAGEMENT AND ENTREPRENEURSHIP	1. Understand the fundamental concepts of Management and its functions. 2. Understand the different functions to be performed by managers/Entrepreneur. 3. Understand the social responsibilities of a Business. 4. Understand the Concepts of Entrepreneurship and to identify Business opportunities. 5. Understand the components in developing a business plan and awareness about various sources of funding and Institutions supporting Entrepreneur.
	21EC62	Microwave Theory and Antennas	1. Describe the use and advantages of microwave transmission 2. Analyze various parameters related to transmission lines. 3. Identify microwave devices for several applications. 4. Analyze various antenna parameters and their significance in building the RF system. 5. Identify various antenna configurations for suitable applications.
	21EC63	VLSI Design and Testing	1. Demonstrate understanding of MOS transistor theory, CMOS fabrication flow and technology scaling. 2. Draw the basic gates using the stick and layout diagram with the knowledge of physical design aspects. 3. Interpret memory elements along with timing considerations. 4. Interpret testing and testability issues in combinational logic design. 5. Interpret testing and testability issues in combinational logic design.
	21ECL66	VLSI Laboratory	1. Design and simulate combinational and sequential digital circuits using Verilog HDL. 2. Understand the synthesis process of digital circuits using EDA tool. 3. Perform ASIC design flow and understand the process of synthesis, synthesis constraints and evaluating the synthesis reports to obtain optimum gate level netlist. 4. Design and simulate basic CMOS circuits like inverter, common source amplifier, differential amplifier, SRAM. 5. Perform RTL_GDSII flow and understand the stages in ASIC design.
Year	Subject Code	Subject	Co'S
2023- 2024 7th Sem	18EC71	COMPUTER NETWORKS	1. Understand the concepts of networking. 2. Describe the various networking architectures. 3. Identify the protocols and services of different layers. 4. Distinguish the basic network configurations and standards associated with each network. 5. Analyze a simple network and measure its parameters.
	18EC72	VLSI DESIGN	1. Demonstrate understanding of MOS transistor theory, CMOS fabrication flow and technology scaling. 2. Draw the basic gates using the stick and layout diagrams with the knowledge of physical design aspects. 3. Demonstrate ability to design Combinational, sequential and dynamic logic circuits as per the requirements 4. Interpret Memory elements along with timing considerations 5. Interpret testing and testability issues in VLSI Design
Year	Subject Code	Subject	Co'S

2023-2024 8th Sem	18EC81	WIRELESS AND CELLULAR COMMUNICATIONS	1. Understand the Communication theory both Physical and network- ing associated with GSM, CDMA & LTE 4G systems. 2 Explain concepts of propagation mechanisms like Reflection, Dif- fraction, Scattering in wireless channels. 3. Develop a scheme for idle mode, call set up, call progress handling and call tear down in a GSM cellular network. 4. Develop a scheme for idle mode, call set up, call progress handling and call tear down in a CDMA cellular network. 5. Understand the Basic operations of Air interface in a LTE 4G system.
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