DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

2021 SCHEME-COURSE OUTCOME

Upon the completion of the course, the students will be able to,

Course Code	Course Name	CO Code	CO Statements	BTL Level
21MAT11	CALCULUS AND DIFFERENTIAL EQUATION	C111.1	Extend the knowledge of calculus to solve problems related to polar curves and its applications in determining the bent ness of a curve.	L2
		C111.2	Describe the notion of partial differentiation to calculate rate of change of multivariate functions.	L2
		C111.3	Solve first-order linear/nonlinear ordinary differential equations analytically using standard methods.	L3
		C111.4	Demonstrate various models through higher order differential equations and solve such linear ordinary differential equations.	L3
		C111.5	Test the consistency of a system of linear equations and to solve them by direct and iterative methods.	L3
21PHY12	ENGINEERING PHYSICS	C112.1	Interpret the types of mechanical vibrations and their applications, the role of Shock waves in various fields.	L2
		C112.2	Demonstrate the quantization of energy for microscopic system.	L2
		C112.3	Apply LASER and Optical fibers in electronic system.	L3
		C112.4	Identify merits of quantum free electron theory and applications of Hall effect.	L3
		C112.5	Analyze the importance of XRD and Electron Microscopy in Nano material characterization.	L3
21ELE13	BASIC ELECTRICAL ENGINEERING	C113.1	Outline the basic DC and AC electric circuits.	L2
		C113.2	Explain the working principles of transformers and electrical machines.	L2
		C113.3	Illustrate the concepts of electric power transmission and distribution of power.	L2
		C113.4	Interpret the wiring methods, electricity billing.	L2
		C113.5	Summarize the working principles of circuit protective devices and personal safety measures.	L2
21CIV14	ELEMENTS OF CIVIL ENGINEERING AND MECHANICS	C114.1	Outline the various fields of civil engineering.	L2
		C114.2	Demonstrate the resultant of a force system and resolution of a force.	L2
		C114.3	Construct the action for forces, moments, and other types of loads on rigid bodies and compute the reactive forces.	L3
		C114.4	Locate the centroid and compute the moment of inertia of regular and built-up sections.	L3
		C114.5	Analyze the bodies in motion.	L3
21EVN15	ENGINEERING VISUALIZATION	C115.1	Outline the visualizing objects with definite shape and dimensions.	L2
		C115.2	Analyze the shape and size of objects through different views.	L2
		C115.3	Develop the lateral surfaces of the object.	L2

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		C115.4	Create a 3D view using CAD software.	L3
		C115.5	Select the interdisciplinary engineering components or systems through its graphical representation.	L3
21PHYL16	ENGINEERING PHYSICS LAB	C116.1	Outline the measuring techniques.	L2
		C116.2	Demonstrate different instruments and be capable to analyze the experimental results.	L2
		C116.3	Construct the circuits and their analysis.	L3
		C116.4	Analyze the electronic circuits.	L3
		C116.5	Identify the error in measurements and the ability to prepare a valid laboratory record.	L3
21ELE17	BASIC ELECTRICAL ENGINEERING LAB	C117.1	Outline KCL and KVL and maximum power transfer theorem for DC circuits.	L2
		C117.2	Compare power factors of different types of lamps.	L4
		C117.3	Examine the measurement of the impedance of an electrical circuit and power consumed by a 3-phase load.	L4
		C117.4	Analyze two-way and three-way control of lamps.	L4
		C117.5	Experiment with the effects of open and short circuits in simple circuits.	L4
21EGH18	COMMUNICATIVE ENGLISH	C118.1	Outline the fundamentals of communication skills in engineering profession.	L2
		C118.2	Identify the nuances of phonetics, intonation and enhance pronunciation skills.	L2
		C118.3	Rephrase basic English grammar and essentials of language skills as per present requirement.	L2
		C118.4	Translate all types of English vocabulary and language proficiency.	L2
		C118.5	Apply the Techniques of Information Transfer through presentation.	L3
21IDT19	INNOVATION AND DESIGN THINKING	C119.1	Explain Various Design Process Procedures.	L2
		C119.2	Develop various design ideas through various techniques.	L2
		C119.3	Identify Business process management in IT industries.	L2
		C119.4	Draw technical drawing for Design Ideas.	L2
		C119.5	Outline IDT process in developing a Prototype.	L2
21MAT21	ADVANCED CALCULUS AND NUMERICAL METHODS	C121.1	Extend the concept of change of order of integration and change of variables to evaluate multiple integrals and their usage in computing the area and volume.	L2
		C121.2	Illustrate the applications of multivariate calculus to understand the solenoid and irrational vectors and also exhibit the inter dependence of line, surface and volume integrals.	L2
		C121.3	Formulate physical problems to partial differential equations and to obtain solution for standard practical PDE's.	L2
		C121.4	Apply the knowledge of numerical methods in modeling of various physical and engineering phenomena.	L3
		C121.5	Solve first order ordinary differential equations arising in engineering problems.	L3
		C122.1	Discuss the electrochemical energy systems such as electrodes and batteries.	L2

2021 SCHEME-COURSE OUTCOME

21CHE22	ENGINEERING CHEMISTRY	C122.2	Explain the fundamental concepts of corrosion, its control and surface modification methods namely electroplating and electro less plating.	L2
		C122.3	Enumerate the importance, synthesis and applications of polymers. Understand properties and application of nanomaterial.	L2
		C122.4	Describe the principles of green chemistry; understand properties and application alternative fuels.	L2
		C122.5	Illustrate the fundamental principles of water chemistry, applications of volumetric and analytical instrumentation.	L2
21PSP23	PROBLEM SOLVING THROUGH PROGRAMMING	C123.1	Explain the basic architecture and functionalities of a computer and also recognize the hardware parts.	L2
		C123.2	Apply programming constructs of C language to solve the real world problem.	L3
		C123.3	Build user-defined data structures like arrays in implementing solutions to problems like searching and sorting.	L3
		C123.4	Develop user-defined data structures like structures, unions and pointers in implementing solutions.	L3
		C123.5	Identify solutions to problems using modular programming constructs using functions.	L3
21ELN24	BASIC ELECTRONICS & COMMUNICATION ENGINEERING	C124.1	Describe the concepts of electronic circuits encompassing power supplies, amplifiers and oscillators.	L2
		C124.2	Outline the basics of digital logic engineering including data representation, circuits and the microcontroller system with associated sensors and actuators.	L2
		C124.3	Explain the characteristics and technological advances of embedded systems.	L2
		C124.4	Relate to the fundamentals of communication engineering spanning from the frequency spectrum to the various circuits involved including antennas.	L2
		C124.5	Explain the different modes of communications from wired to wireless and the computing involved.	L2
21EME25	ELEMENTS OF MECHANICAL ENGINEERING	C125.1	Outline the basic concepts of mechanical engineering in the fields of energy and its utilization, materials technology, manufacturing techniques, and transmission systems through demonstrations.	L2
		C125.2	Illustrate the application of energy sources in Power generation and utilization, Engineering materials, manufacturing, and machine techniques leading to the latest advancements and transmission systems in day to day activities.	L2
		C125.3	Apply the skills in developing simple mechanical elements and processes.	L3
		C125.4	Build knowledge of various engineering materials and metal joining techniques.	L3
		C125.5	Construct essential experience with heat transfer devices.	L3
21CHEL26	ENGINEERING	C126.1	Examine the pKa and coefficient of Viscosity of a given organic liquid.	L4
		C126.2	Estimate the amount of substance present in the given solution using Potentiometer Conductometric and Colorimetric.	L4
		C126.3	Determine the total hardness and chemical oxygen demand in the	L4

	CHEMISTRY LAB		given solution by volumetric analysis method.	
		C126.4	Estimate the percentage of Nickel, copper and Iron in the given analytic solution by titration method.	L4
		C126.5	Demonstrate flame photometric estimation of sodium & potassium and the synthesis of nano materials by Precipitation method.	L4
21CPL27	COMPUTER PROGRAMMING LAB	C127.1	Explain the problem statement and identify the need for computer programming.	L2
		C127.2	Make use of C compiler, IDE for programming, identify and correct the syntax and syntactic errors in programming.	L3
		C127.3	Develop algorithm, flowchart and write programs to solve the given problem	L3
		C127.4	Demonstrate use of functions, recursive functions, arrays, strings in problem solving.	L4
		C127.5	Inspect use of structures and pointers in problem solving.	L4
21EGH28	PROFESSIONAL WRITING SKILLS IN ENGLISH	C128.1	Identify the common errors in writing and speaking.	L3
		C128.2	Develop better technical writing and presentation skills.	L3
		C128.3	Interpret technical proposals properly and make them to Write good technical reports.	L3
		C128.4	Build workplace communication skills.	L3
		C128.5	Utilize the techniques of information transfer through presentation in different level.	L3
21SFH9	SCIENTIFIC FOUNDATIONS OF HEALTH	C129.1	Explain about Health and wellness (and its Beliefs) and its balance for a positive mindset.	L2
		C129.2	Develop healthy lifestyles for good health for the better future.	L2
		C129.3	Build healthy and caring relationships to meet the requirements of good /social/positive life.	L2
		C129.4	Demonstrate the avoiding risks and harmful habits in the campus and outside the campus for the bright future.	L2
		C129.5	Outline the preventive measures and fight against harmful diseases for a good health through positive mindset.	L2
21MAT31	MATHEMATICS-III	C231.1	Solve ordinary differential equations using Laplace transform.	L3
		C231.2	Demonstrate the Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing and field theory.	L3
		C231.3	Use Fourier transforms to analyze problems involving continuous-time signals and to apply Z- Transform techniques to solve difference equations.	L3
		C231.4	Solve mathematical models represented by initial or boundary value problems involving partial differential equations.	L3
		C231.5	Determine the extremals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.	L3
		C232.1	Outline different data structures and their applications.	L2
		C232.2	Describe stack and queues in solving problems.	L2

21CS32	DATA STRUCTURES AND APPLICATIONS	C232.3	Demonstrate applications of linked list.	L3
		C232.4	Construct applications of trees and graphs to model and solve the real-world problem.	L3
		C232.5	Make use of Hashing techniques and resolve collisions during mapping of key value pairs.	L3
21CS33	ANALOG AND DIGITAL ELECTRONICS	C233.1	Explain the application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp.	L2
		C233.2	Outline the basic principles of A/D and D/A conversion circuits and develop the same.	L2
		C233.3	Illustrate the digital circuits using Karnaugh Map, and Quine-McClusky Methods.	L2
		C233.4	Identify Gates and flip flops and make us in designing different data processing circuits, registers and counters and compare the types.	L3
		C233.5	Develop simple HDL programs.	L3
21CS34	COMPUTER ORGANIZATION AND ARCHITECTURE	C234.1	Explain the organization and architecture of computer systems with machine instructions and programs.	L2
		C234.2	Outline the input/output devices communicating with computer system.	L2
		C234.3	Demonstrate the functions of different types of memory devices.	L2
		C234.4	Compare different data types on simple arithmetic and logical unit.	L2
		C234.5	Demonstrate the functions of basic processing unit, Parallel processing and pipelining.	L2
21CSL35	OBJECT ORIENTED PROGRAMMING WITH JAVA LABORATORY	C235.1	Make use of Eclipse/NetBeans IDE to design, develop, and debug Java Projects.	L3
		C235.2	Identify the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP.	L3
		C235.3	Demonstrate the ability to design and develop java programs, analyze, and interpret object oriented data and document results.	L3
		C235.4	Apply the concepts of multiprogramming, exception/event handling, and abstraction to develop robust programs.	L3
		C235.5	Develop user friendly applications using File I/O and GUI concepts.	L3
21SCR36	SOCIAL CONNECT & RESPONSIBILITIES	C236.1	Explain the social responsibility.	L2
		C236.2	Show the significance of sustainable development.	L2
		C236.3	Summarize sustainability and creativity.	L2
		C236.4	Outline the organizational skill.	L2
		C236.5	Organize planning and organizational skills.	L3
		C237.1	Explain the necessity of learning of local language for comfortable life.	L2
		C237.2	Speak, read and write Kannada language as per requirement.	L2

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21KAK37/K VK37	SAMSKRUTIKA KANNADA/ BALAKE KANNADA	C237.3	Communicate (converse) in Kannada language in their daily life with kannada speakers.	L2
		C237.4	Listen and understand the Kannada language properly.	L2
		C237.5	Speak in polite conversation.	L2
21CSL381	MASTERING OFFICE MASTERING OFFICE	C238.1	Outline the basics of computers and prepare documents, spreadsheets, make small presentations with audio, video and graphs and would be acquainted with internet.	L2
		C238.2	Demonstrate the Create, edit, save and print documents with list tables, header, footer, graphic, spellchecker, mail merge and grammar checker	L2
		C238.3	Apply the knowledge about spreadsheet with formula, macros spell checker etc.	L3
		C238.4	Inspect how to apply application software in an office environment.	L4
		C238.5	Analyze Google Suite for office data management tasks.	L4
21MAT41	MATHEMATICA L FOUNDATIONSFOR COMPUTING	C241.1	Apply the concepts of logic for effective computation and relating problems in the Engineering domain.	L3
		C241.2	Analyze the concepts of functions and relations to various fields of Engineering comprehend the concept of graph theory for various applications of computational sciences.	L3
		C241.3	Build discrete and continuous probability distributions in analyzing the probability models arising in the engineering field.	L3
		C241.4	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.	L3
		C241.5	Construct joint probability distributions and demonstrate the validity of testing the hypothesis.	L3
21CS42	DESIGN AND ANALYSIS OF ALGORITHMS	C242.1	Analyze the performance of the algorithms, state the efficiency using asymptotic notations and analyze mathematically the complexity of the algorithm.	L3
		C242.2	Construct divide and conquer approaches and decrease and conquer approaches in solving the problems and analyze the same.	L3
		C242.3	Apply the appropriate algorithmic design technique like greedy method, transform and conquer approaches and compare the efficiency of algorithms to solve the given problem.	L3
		C242.4	Develop dynamic programming approaches to solve some problems and improve algorithm time efficiency by sacrificing space.	L3
		C242.5	Build and analyze backtracking, branch and bound methods and to describe P, NP and NP complete problems.	L3
21CS43	MICROCONTROL LER AND EMBEDDED SYSTEMS	C243.1	Outline the ARM microcontroller's architectural features and program module.	L2
		C243.2	Explain the basics of C compiler and Optimization.	L2
		C243.3	Interpret the knowledge gained from programming on ARM in different application.	L2
		C243.4	Implement the basic hardware components & their application solution methods.	L3

		C243.5	Build the need for a RTOS & embedded systems.	L3
21CS44	OPERATING SYSTEMS	C244.1	Explain the structure of an operating system and its scheduling mechanism.	L2
		C244.2	Demonstrate the allocation of resources for a process using scheduling algorithm.	L2
		C244.3	Identify the root causes of deadlock and provide the solution for deadlock elimination.	L2
		C244.4	Describe about the storage structures and learn about the Linux Operating system.	L2
		C244.5	Build storage structures and implement customized case study.	L3
21BE45	BIOLOGY FOR ENGINEERS	C245.1	Outline the basic biological concepts like biomolecules and their applications.	L2
		C245.2	Explain human organ systems and bio designs.	L2
		C245.3	Relate the concepts of biomimetic for specific requirements.	L2
		C2452.4	Compare the nature-bio inspired materials and mechanisms.	L2
		C245.5	Interpret the trends in Bio engineering.	L2
21CSL46	PYTHON PROGRAMMING LABORATORY	C246.1	Demonstrate proficiency in handling of loops and creation of functions.	L2
		C246.2	Identify the methods to create and manipulate lists, tuples and dictionaries.	L2
		C246.3	Describe the commonly used operations involvingregular expressions and file system.	L2
		C246.4	Interpret the concepts of Object-Oriented Programming as used in Python.	L2
		C246.5	Extend the need for scraping websites and working with PDF, JSON and other file formats.	L2
21CIP47	CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS	C247.1	Outline the basic structure of Indian Constitution.	L2
		C247.2	Explain the Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.	L2
		C247.3	Describe about our Union Government, political structures, codes and procedures.	L2
		C247.4	Outline our State Executive & Elections system of India.	L2
		C247.5	Identify Amendments and Emergency provisions, other important provisions given by the constitution.	L3
21CSL481	WEB PROGRAMMING	C248.1	Discover the fundamentals of web and concept of HTML.	L4
		C248.2	Use the concepts of HTML, XHTML to construct the web pages.	L4
		C248.3	Demonstrate CSS for dynamic documents.	L4
		C248.4	Analyze different concepts of JavaScript & Construct dynamic documents.	L4

		C248.5	Design a small project with JavaScript and XHTML.	L4
21UH49	UNIVERSAL HUMAN VALUES	C249.1	Demonstrate the values and skills to ensure sustained happiness and prosperity of all human beings.	L2
		C249.2	Outline socially responsible behavior.	L2
		C249.3	Describe ethical human conduct, trustful and mutually fulfilling human behavior.	L2
		C249.4	Explain environmentally responsible and capabilities for maintaining Health and Hygiene.	L2
		C249.5	Identify the aspiration for excellence (merit) and gratitude for all of the Holistic understanding at Professional Ethics.	L2
21CS51	AUTOMATA THEORY AND COMPILER DESIGN	C351.1	Outline fundamental concepts in automata theory and Theory of Computation.	L2
		C351.2	Develop lexical analyzers, parsers and code generators.	L2
		C351.3	Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers.	L3
		C351.4	Acquire fundamental understanding of the structure of a Compiler and Apply concepts automata theory and Theory of Computation to design Compilers.	L3
		C351.5	Design computations models for problems in Automata theory and adaptation of such model in the field of compilers.	L4
21CS52	COMPUTER NETWORKS	C352.1	Outline the basic layers and fundamentals of network hardware and software.	L2
		C352.2	Explain the design issues of DLL, Error detection and correction and multiple Access protocols.	L2
		C352.3	Demonstrate the data flow from one node to another node using routing algorithm.	L2
		C352.4	Develop the various protocols and services in transport layer.	L3
		C352.5	Organize the working principles of various application layer protocols.	L3
21CS53	DATABASE MANAGEMENT SYSTEMS	C353.1	Outline database objects, enforce Integrity constraints on a database using RDBMS.	L2
		C353.2	Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of queryEvaluation.	L2
		C353.3	Build simple database systems and relate the concept of transaction, concurrency control and recovery in database.	L3
		C353.4	Develop application to interact with databases, relational algebra expression.	L3
		C353.5	Construct applications using tuple and domain relation expression from queries.	L3
		C354.1	Outline the knowledge of searching and reasoning techniques for different applications.	L2
			Explain machine learning in relation to other fields and fundamental	L2

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21CS54	ARTIFICIAL INTELLIGENCEAND MACHINE LEARNING	C354.2	issues and challenges of machine learning.	
		C354.3	Apply the knowledge of classification algorithms on various dataset and compare the results.	L3
		C354.4	Model the neuron and Neural Network, and to analyze ANN learning and its applications.	L3
		C354.5	Identify the suitable clustering algorithm for different pattern.	L3
21CSL55	DATABASE MANAGEMENT SYSTEM LABORATORY WITH MINI PROJECT	C355.1	Examine Create and Update queries on the database.	L4
		C355.2	Demonstrate the working of different concepts of DBMS.	L4
		C355.3	Create database systems with the concept of transaction, concurrency control and recovery in database.	L4
		C355.4	Distinguish relational algebra expression.	L4
		C355.5	Implement, analyze and evaluate the project developed for an application.	L4
21RMI56	RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS	C356.1	Summarize the meaning of engineering research.	L2
		C356.2	Outline the procedure of Literature Review and Technical Reading.	L2
		C356.3	Explain the fundamentals of patent laws and drafting procedure.	L2
		C356.4	Demonstrate the copyright laws and subject matters of copyrights and designs.	L2
		C356.5	Describe the basic principles of design rights.	L2
21CIV57	ENVIRONMENTAL STUDIES	C357.1	Outline the principles of ecology and environmental issues that apply to air, land and water issues on a global scale.	L2
		C357.2	Demonstrate critical thinking and/or observation skills and apply them to the analysis of a problem or question related to the environment.	L2
		C357.3	Develop ecology knowledge of a complex relationship between biotic and abiotic components.	L3
		C357.4	Apply ecological knowledge to issues.	L3
		C357.5	Build and graph a problem and describe the realities that managers face when dealing with complex	L3
21CSL581	ANGULAR JS AND NODE JS	C358.1	Select the features of Angular JS.	L3
		C358.2	Recognize the form validations and controls.	L3
		C358.3	Implement Directives and Controllers.	L3
		C358.4	Evaluate and create database for simple application.	L4
		C358.5	Analyze webservers with node using Node JS.	L4
		C359.1	Develop programs involving basic features of C# programming language	L3
		C359.2	Make use of exception handling features to safeguard program against runtime anomalies.	L3

21CSL582	C# PROGRAMMING	C359.3	Apply concepts of OOP in developing solutions to problems.	L3
		C359.4	Develop programs to illustrate handling of text files.	L3
		C359.5	Build modern tools to develop C# programs and applications.	L3
21CS61	SOFTWARE ENGINEERING & PROJECT MANAGEMENT	C3510.1	Outline the activities involved in software engineering and analyze the role of various process models.	L2
		C3510.2	Explain the basics of object-oriented concepts and build a suitable class model using modeling techniques.	L2
		C3510.3	Describe various software testing methods and to understand the importance of agile methodology and Devops.	L2
		C3510.4	Illustrate the role of project planning and quality management in software development.	L2
		C3510.5	Identify the importance of activity planning and different planning models.	L3
21CS62	FULLSTACK DEVELOPMENT	C3511.1	Outline the working of MVT based full stack web development with Django.	L2
		C3511.2	Illustrate of Models and Forms for rapid development of web pages.	L2
		C3511.3	Identify the role of Template Inheritance and Generic views for developing full stack web applications.	L2
		C3511.4	Apply the Django framework libraries to render non HTML contents like CSV and PDF.	L3
		C3511.5	Perform jQuery based AJAX integration to Django Apps to build responsive full stack web applications.	L3
21CS63	COMPUTER GRAPHICS AND FUNDAMENTALS OF IMAGE PROCESSING	C3512.1	Construct geometric objects using Computer Graphics principles and OpenGL APIs.	L3
		C3512.2	Examine OpenGL APIs and related mathematics for 2D and 3D geometric Operations on the objects.	L4
		C3512.3	Design GUI with necessary techniques required to animate the created objects.	L4
		C3512.4	Inspect OpenCV for developing Image processing applications.	L4
		C3512.5	Discover image segmentation techniques along with programming, using OpenCV, for developing simple applications.	L4
21CS641	AGILE TECHNOLOGIES	C3513.1	Outline the fundamentals of agile technologies.	L2
		C3513.2	Explain XP Lifecycle, XP Concepts and Adopting XP.	L2
		C3513.3	Apply different techniques on Practicing XP, Collaborating and Releasing.	L3
		C3513.4	Identify the Values and Principles of Mastering Agility.	L3
		C3513.5	Demonstrate the agility to deliver good values.	L3
21CS642	ADVANCED JAVA PROGRAMMING	C3514.1	Outline the fundamental concepts of Enumerations and Annotations.	L2
		C3514.2	Apply the concepts of Generic classes in Java programs.	L3
		C3514.3	Demonstrate the concepts of String operations in Java.	L3
		C3514.4	Develop web based applications using Java servlets and JSP	L3

		C3514.5	Illustrate database interaction and transaction processing in Java	L3
21CS643	ADVANCED COMPUTER ARCHITECTURE	C3515.1	Explain the concepts of parallel computing.	L2
		C3515.2	Identify the hardware technologies.	L2
		C3515.3	Compare and contrast the parallel architectures.	L3
		C3515.4	Illustrate parallel programming concepts.	L3
		C3515.5	Demonstrate the multi computer and multiprocessor.	L3
21CS644	DATA SCIENCE AND VISUALIZATION	C3516.1	Summarize the data in different forms.	L2
		C3516.2	Apply different techniques to Explore Data Analysis and the Data Science Process.	L3
		C3516.3	Analyze feature selection algorithms & design a recommender system.	L3
		C3516.4	Evaluate data visualization tools and libraries and plot graphs.	L4
		C3516.5	Develop different charts and include mathematical expressions.	L4
21CSL66	COMPUTER GRAPHICS AND IMAGE PROCESSING LABORATORY	C3517.1	Use openGL /OpenCV for the development of mini Projects.	L4
		C3517.2	Analyze the necessity mathematics and design required to demonstrate basic geometric transformation techniques.	L4
		C3517.3	Demonstrate the ability to design and develop input interactive techniques.	L4
		C3517.4	Apply the concepts to Develop user friendly applications using Graphics and IP concepts.	L4
		C3517.5	Demonstrate the image processing operations on images.	L4
21CS71	Big Data Analytics	C471.1	Outline fundamentals and applications of Big Data analytics.	L2
		C471.2	Identify Hadoop framework, Hadoop Distributed File system and essential Hadoop tools.	L3
		C471.3	Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.	L3
		C471.4	Demonstrate the Map Reduce programming model to process the big data along with Hadoop tools.	L3
		C471.5	Apply Machine Learning algorithms for real world big data, web contents and Social Networks to provide analytics with relevant visualization tools.	L3
21CS72	Cloud Computing	C472.1	Summarize various cloud computing platforms and service provider.	L2
		C472.2	Illustrate various virtualization concepts.	L3
		C472.3	Identify the architecture, infrastructure and delivery models of cloud computing.	L3
		C472.4	Choose the Security aspects of CLOUD.	L3
		C472.5	Select platforms for development of cloud applications	L3
21CS731	Object oriented Modeling and	C473.1	Describe the concepts of object-oriented and basic class modeling.	L2
		C473.2	Draw class diagrams, sequence diagrams and interaction diagrams to solve problems.	L2

	Design	C473.3	Choose and apply a befitting design pattern for the given problem.	L3
21CS732	Digital Image Processing	C474.1	Outline the fundamentals of Digital Image Processing.	L2
		C474.2	Apply different Image transformation techniques.	L3
		C474.3	Identify various image restoration techniques.	L3
		C474.4	Build colour image and morphological processing.	L3
		C474.5	Develop image analysis and segmentation techniques.	L3
21CS733	Cryptography and Network Security	C475.1	Outline Cryptography, Network Security theories, algorithms and systems.	L2
		C475.2	Demonstrate different Cryptography and Network Security operations on different applications .	L2
		C475.3	Explain different methods for authentication and access control.	L2
		C475.4	Identify Public and Private key, Key management, distribution and certification.	L3
		C475.5	Construct necessary techniques to build protection mechanisms to secure computer networks.	L3
21CS734	Block chain Technology	C476.1	Explain the concepts of Distributed computing and its role in Blockchain.	L2
		C476.2	Describe the concepts of Cryptography and its role in Blockchain.	L2
		C476.3	List the benefits, drawbacks and applications of Blockchain.	L2
		C476.4	Identify the technologies involved in Bitcoin.	L3
		C476.5	Demonstrate the Ethereum platform to develop block chain application.	L3
21CS735	Internet of Things	C477.1	Outline the evolution of IoT, IoT networking components, and addressing strategies in IoT.	L2
		C477.2	Explain various sensing devices and actuator types.	L2
		C477.3	Demonstrate the processing in IoT.	L2
		C477.4	Apply different connectivity technologies.	L3
		C477.5	Identify the communication technologies, protocols and interoperability in IoT.	L3
21CS741	Software Architecture and Design Patterns	C478.1	Demonstrate the codes with higher performance and lower complexity.	L2
		C478.2	Illustrate the qualities needed to keep code flexible.	L2
		C478.3	Interpret core design principles and be able to assess the quality of a design with respect to these principles.	L2
		C478.4	Explain these principles in the design of object oriented systems.	L2
		C478.5	Demonstrate an understanding of a range of design patterns.	L2
		C479.1	Demonstrate the decision process with different constraints.	L2

21CS742	Multi agent Systems	C479.2	Illustrate the games in different forms.	L2
		C479.3	Apply the cooperative learning in developing games.	L3
		C479.4	Select the different negotiation strategies of Multi-Agent System	L3
		C479.5	Construct the solutions for voting problems.	L3
21CS743	Deep Learning	C4710.1	Outline the fundamental issues and challenges of deep learning data, model selection, model complexity etc.,	L2
		C4710.2	Illustrate the various knowledge on deep learning and algorithms	L2
		C4710.3	Apply CNN and RNN model for real time applications .	L3
		C4710.4	Identify various challenges involved in designing and implementing deep learning algorithms.	L3
		C4710.5	Select the deep learning algorithms for the given types of learning tasks in varied domain.	L3
21CS744	Robotic Process Automation Design and Development	C4711.1	Summarize the basic concepts of RPA.	L2
		C4711.2	Describe various components and platforms of RPA .	L2
		C4711.3	Illustrate the different types of variables, control flow and data manipulation techniques.	L2
		C4711.4	Interpret the various control techniques and OCR in RPA .	L2
		C4711.5	Outline the various types and strategies to handle exceptions.	L2
21CS745	NoSQL Data Base	C4712.1	Demonstrate an understanding of the detailed architecture of column Oriented NoSQL databases, document databases, graph databases.	L2
		C4712.2	Explain the concepts pertaining to all the types of databases.	L2
		C4712.3	Illustrate the structural Models of NoSQL.	L2
		C4712.4	Develop various applications using NoSQL databases.	L2
21EC741	Optical & Satellite Communication	C4713.1	Classify optical fibers and devices used for optical communication.	L2
		C4713.2	Explain the principle of operation of optical devices used for multiplexing and amplification of light.	L2
		C4713.3	Illustrate the satellite orbits and its trajectories with the definitions of parameters associated with it.	L2
		C4713.4	Interpret the electronic hardware systems associated with the satellite subsystem and earth station.	L2
		C4713.5	Summarize the functioning of satellites for communication, remote sensing, and weather and navigation applications.	L2
21EC742	ARM Embedded Systems	C4714.1	Describe the architectural features and instructions of 32 bit microcontroller ARM Cortex M3	L2
		C4714.2	Explain the knowledge gained for Programming ARM Cortex M3 for different applications	L2
		C4714.3	Show the basic hardware components and their selection method based on the characteristics and attributes of an embedded system	L2
		C4714.4	Explain the firmware in ARM design approaches.	L2

		C4714.5	Outline the need of real time operating system for embedded system applications.	L2
21EC743	Basic Digital Image Processing	C4715.1	Summarize image formation and the role of human visual system plays in perception of gray and color image data	L2
		C4715.2	Apply image processing techniques in spatial domains	L3
		C4715.3	Develop image processing techniques in frequency (Fourier) domains.	L3
		C4715.4	Select independent study and analysis of Image Enhancement techniques.	L3
21EC744	Basic Digital Signal Processing	C4716.1	Outline the continuous time and discrete time signals and systems, in time and frequency domain.	L2
		C4716.2	Apply the concepts of signals and systems to obtain the desired parameter/representation.	L3
		C4716.3	Design analog/digital filters to meet given specifications.	L3
		C4716.4	Implement the analog filter using components/suitable simulation tools.	L3
		C4716.5	Construct the digital filter (FIR/IIR) using suitable simulation tools, and record the input and output of the filter for the given audio signal.	L3
21EC745	E-waste Management	C4717.1	Outline the existing discourse on e-waste and its management, statistics across the world, opportunities, and challenges w.r.t. regulatory framework, SDGs, CE, and LCIA (Life Cycle Impact Assessment) and MFA (Material Flow Analysis), Indian scenario.	L2
		C4717.2	Explain EPR, a regulatory framework for achieving specified goals across different countries and impacts on environment and human health.	L2
		C4717.3	Describe themes in the context of resource use and sustainable development. Urban mining, informal sector operations and need for resource use policy, financial support for recycling infrastructure building, etc. in Indian context and also explain to what extent – different aspects of e-waste management have been incorporated in the existing regulatory framework in comparison with international legislatures.	L2
		C4717.4	Identify and infer pan-Indian initiatives dealing with e-waste management, ranging from building knowledge base through research and social action by different stakeholders to technological and legal advancements, and industrial initiatives.	L3
		C4717.5	Use opportunities and challenges around four domains: legal and judicial domain; economic concerns; recycling culture/society; and environment concerns.	L3
21EE741	Carbon Capture and Storage	C4718.1	Outline the impacts of climate change and the measures that can be taken to reduce emissions.	L2
		C4718.2	Compare carbon capture and carbon storage.	L2
		C4718.3	Summarize the fundamentals of power generation.	L2
		C4718.4	Explain methods of carbon capture from power generation and industrial processes.	L2
		C4718.5	Illustrate the different carbon storage methods: storage in coal seams, depleted gas reservoirs and saline formations and Explain Carbon dioxide compression and pipeline transport.	L2

21EE742	Electric Vehicles	C4719.1	Explain the roadway fundamentals, laws of motion, vehicle mechanics and propulsion system design	L2
		C4719.2	Illustrate the working of electric vehicles and hybrid electric vehicles in recent trends	L2
		C4719.3	Model batteries, Fuel cells, PEMFC and super capacitors.	L3
		C4719.4	Identify DC and AC drive topologies used for electric vehicle application.	L3
		C4719.5	Develop the electric propulsion unit and its control for application of electric vehicles.	L3
21EE743	Disasters Management	C4720.1	Explain disaster management plan, cyclones and their hazard potential.	L2
		C4720.2	Show the role of IMD and cyclone prediction and cyclone warning system in India.	L2
		C4720.3	Outline the role of different institutions defense and other services in natural disaster management.	L2
		C4720.4	Show the role of Central Water Commission in river water sharing, Draught, its assessment and draught management plan.	L2
		C4720.5	Summarize the occurrence of earth quake, Tsunamis and thunderstorms.	L2
21EE744	Electrical Power Quality	C4721.1	Demonstrate power quality procedures and standards.	L2
		C4721.2	Explain voltage sag performance; explain principles of protection and Sources of transient over voltages.	L2
		C4721.3	Identify various sources of harmonics, explain effects of harmonic distortion.	L2
		C4721.4	Describe harmonic distortion, control harmonic distortion.	L2
		C4721.5	Show power quality in distribution planning and Identify power quality issues in utility system	L2
21EE745	Energy Conservation and Audit	C4722.1	Explain about energy scenario nationwide and worldwide , also outline Energy Conservation Act and its features	L2
		C4722.2	Describe load management techniques and energy efficiency.	L2
		C4722.3	Outline the need of energy audit and energy audit methodology.	L2
		C4722.4	Illustrate the various pillars of electricity market design.	L2
		C4722.5	Demonstrate energy audit of electrical systems and buildings and Show an understanding of demand side management and energy conservation.	L2
21ME751	Non-traditional Machining	C4723.1	Summarize the compare traditional and non-traditional machining process and recognize the need for Nontraditional machining process.	L2
		C4723.2	Explain the constructional features, performance parameters, process characteristics, applications, advantages and limitations of USM, AJM and WJM	L2
		C4723.3	Outline the need of Chemical and electro-chemical machining process along with the constructional features, process parameters, process characteristics, applications, advantages and limitations	L2
		C4723.4	Describe the constructional feature of the equipment, process parameters, process characteristics, applications, advantages and limitations EDM & PAM	L2

		C4723.5	Illustrate the LBM equipment, LBM parameters, and characteristics. EBM equipment and mechanism of metal removal, applications, advantages and limitations LBM & EBM.	L2
21ME752	Hydraulics and Pneumatics	C4724.1	Outline knowledge of hydraulic and pneumatic system and its components	L2
		C4724.2	Explain the working principle of various hydraulic and pneumatic components.	L2
		C4724.3	Apply working principles of Hydraulic and Pneumatic Systems for various applications.	L3
		C4724.4	Identify the cause for hydraulic and pneumatic system break down and performance of hydraulic pumps, motors.	L3
21ME753	Operations Research	C4725.1	Explain the meaning, definitions, scope, need, phases and techniques of operations research	L2
		C4725.2	Demonstrate as L.P.P and derive optimal solutions to linear programming problems by graphical method, Simplex method, Big-M method and Dual Simplex method.	L2
		C4725.3	Identify as Transportation and Assignment problems and derive optimum solutions for transportation, Assignment and travelling salesman problems	L3
		C4725.4	Solve problems on game theory for pure and mixed strategy under competitive environment.	L3
		C4725.5	Construct network diagrams and determine critical path, floats for deterministic and PERT networks including crashing of Networks	L3
21CSP76	Project work	C4726.1	Survey the changes in the technologies relevant to the topic selected.	L4
		C4726.2	Discuss the technology and interpret the impact on the society.	L5
		C4726.3	Discuss the technology and interpret the impact on the environment.	L5
		C4726.4	Discuss the technology and interpret the impact on the domain.	L5
		C4726.5	Compile report of the study and present to the audience, following the ethics.	L5

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