

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**2018 SCHEME-COURSE OUTCOME**

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

Subject Code	Subject Name	CO Code	CO Statements	BTL Level
18MAT11	ENGINEERING MATHEMATICS- I	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 rates of change of multivariate functions and solve problems related to composite functions and Jacobians.	L2
		C111.3	Apply the concept of order of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes.	L3
		C111.4	Solve first order linear/ nonlinear differential equation analytically using standard methods.	L3
		C111.5	Make use of matrix theory for solving system of linear equations and compute eigenvalues and eigenvectors required for matrix diagonalization process.	L3
18PHY12	ENGINEERING PHYSICS	C112.1	Outline various types of oscillations and their implications, the role of Shock waves in various fields and recognize the elastic properties of materials for Engineering Applications.	L2
		C112.2	Relate the interrelation between time varying electric field and magnetic field, the transverse nature of EM waves and their role in optical fiber communication.	L2
		C112.3	Compute Eigen values, Eigen Functions ,momentum of Atomic and sub atomic particles using Time Independent 1-D Schrodinger's wave Equation.	L3
		C112.4	Apply theoretical background of laser, construction and working of different types of laser and its applications in different fields.	L3
		C112.5	Identify various electrical and thermal properties of materials like conductors, semiconductors and dielectrics using different theoretical models.	L3
		C113.1	Compare DC and AC circuits.	L2
		C113.2	Explain principles and operation of DC Machines.	L2
		C113.3	Choose single phase or 3 phase AC circuits for protective electrical wiring.	L2



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18ELE13	BASIC ELECTRICAL ENGINEERING	C113.4	Explain principles and operation of synchronous machines.	L2
		C113.5	Summarize operation of single phase transformer, concept of electrical wiring and protective devices.	L2
18CIV14	ELEMENTS OF CIVIL ENGINEERING AND MECHANICS	C114.1	Outline the applications of various fields of Civil Engineering.	L2
		C114.2	Illustrate the resultant of given force system subjected to various loads.	L2
		C114.3	Summarize the action of Forces. Moments and other loads on systems of rigid bodies and compute the reactive forces that develop as a result of the external loads.	L2
		C114.4	Identify the Centroid and compute the Moment of Inertia of regular and built-up sections.	L3
		C114.5	Build the relationship between the motions of bodies and analyze the bodies in motion.	L3
18EGDL15	ENGINEERING GRAPHICS	C115.1	Outline the BIS conventions use of Standard tools, coordinate system and reference plane.	L2
		C115.2	Apply the concept of Orthographic projection for solving Problems on straight Lines in different position in reference planes.	L3
		C115.3	Illustrate the concept of Orthographic projection for solving Problems on Plane Surfaces in different positions.	L3
		C115.4	Build the concept of Orthographic projection for solving Problems on 3D elements such as Solids in different.	L3
		C115.5	Choose the 2D sketch represent in 3D solids in combination and apply the principle of section of solids for developing the lateral surfaces.	L3
18PHYL16	ENGINEERING PHYSICS LAB	C116.1	Develop skills to impart practical knowledge in real time solution.	L2
		C116.2	Compare principle, concept working and application of new technology and its results with theoretical calculations.	L2
		C116.3	Make use of new instruments with practical knowledge.	L3
		C116.4	Apply knowledge of new concept in the solution of practical oriented problems and to understand more deep knowledge about the solution to theoretical problems.	L3

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		C116.5	Illustrate measurement technology, usage of new instruments and real time applications in engineering studies.	L3
18ELEL17	BASIC ELECTRICAL ENGINEERING LAB	C117.1	Identify the common electrical components and measuring Instruments.	L3
		C117.2	Compare power factor of lamp.	L4
		C117.3	Determine of impedance of an electrical circuits power consumed by 3 phase load.	L4
		C117.4	Distinguish two way and three way lamp.	L4
		C117.5	Inspect earthing process.	L4
18EGH18	TECHNICAL ENGLISH-I	C118.1	Identify common errors in spoken and written communication	L2
		C118.2	Make use of English vocabulary and language proficiency	L3
		C118.3	Develop nature and style of sensible writing and acquire employment and workplace communication skill.	L3
		C118.4	Build the technical communication skills through technical reading and writing practices.	L3
		C118.5	Organize well in campus recruitment, engineering and all other general competitive examinations	L3
18MAT21	ENGINEERING MATHEMATICS - II	C121.1	Illustrate the applications of multivariate calculus to understand the solenoid and irrational vectors and also exhibit the interdependence of line, surface and volume integrals.	L2
		C121.2	Demonstrate various physical models through higher order differential equations and solve such linear ordinary differential equations.	L2
		C121.3	Explain the variety of Partial differential equations and solution by exact methods/method of separation of variables.	L2
		C121.4	Construct the applications of infinite series and obtain series solution of ordinary differential equations	L3
		C121.5	Apply the knowledge of numerical methods in the modeling of various physical and engineering phenomena.	L3
	ENGINEERING	C122.1	Explain the use of free energy in equilibrium; rationalize bulk properties and processes using thermodynamic considerations, electrochemical energysystems.	L2
		C122.2	Describe modification of surface properties of metals to develop resistance to corrosion, wear, tear, impact etc., by electroplating and electro less plating.	L2

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18CHE22	CHEMISTRY	C122.3	Explain problems using recurrence relations and generating functions.	L2
		C122.4	Outline the environmental pollution, waste management and water chemistry.	L2
		C122.5	Compare the different techniques of instrumental methods of analysis. Fundamental principles of nano materials.	L2
18CPS23	C PROGRAMMING FOR PROBLEM SOLVING	C123.1	Summarize the fundamentals of Computer, algorithm, Flowchart, Basic of C Program.	L2
		C123.2	Illustrate the concepts of Conditional Branching, Looping and I/O Operations.	L3
		C123.3	Describe the Concepts of Arrays and how to implement in real time Problems.	L2
		C123.4	Develop the Concepts of functions and Recursions and how to implement in real time problems.	L3
		C123.5	Implement the Concepts of Structures, Pointers and Preprocessor directives.	L3
18ELN24	BASIC ELECTRONIC S	C124.1	Outline the significance of electronics in different applications & applications of diode in rectifiers, filter circuits and wave shaping and Apply the concept of diode in rectifiers, filters circuits.	L2
		C124.2	Analyse simple circuits like amplifiers (inverting and non inverting), comparators, adders, integrator and differentiator using OPAMPS.	L3
		C124.3	Interpret the different building blocks in digital electronics using logic gates and implement simple logic function using basic universal gates.	L3
		C124.4	Select the functioning of a communication system, and different modulation technologies.	L3
		C124.5	Utilize the basic principles of different types of Transducers.	L3
18ME15	ELEMENTS OF MECHANICAL ENGINEERING	C125.1	Summarize different sources of energy and their conversion process.	L2
		C125.2	Explain the working principle of hydraulic turbines, pumps, IC engines and refrigeration.	L2
		C125.3	Identify various metal joining processes and power transmission elements.	L3
		C125.4	Build the properties of common engineering materials and their applications in engineering industry.	L3
		C125.5	Construct the working of conventional machine tools. machining processes. tools and accessories and describe the advanced manufacturing systems.	L3

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18CHEL26	ENGINEERING CHEMISTRY LAB	C126.1	Illustrate the different types of Instruments & techniques for analysis including pH measurement, Conductivity, Redox titrations.	L2
		C126.2	Inspect key spectroscopic techniques including Flame photometry & Colorimetry.	L4
		C126.3	Examine such as Viscometer in determining viscosity of various liquids.	L4
		C126.4	Analyze the types of titrations for Estimation of concerned materials using Internal indicator method.	L4
		C126.5	Analyze External indicator and Iodometric method for the Estimation of concerned materials.	L4
18CPL27	COMPUTER PROGRAMMING LAB	C127.1	Illustrate the basic C programming looping construct.	L2
		C127.2	Develop the C program for mathematical operations using arrays and Strings.	L4
		C127.3	Inspect the C program for mathematical operations using Structures.	L4
		C127.4	Organize the C program for Real time applications using user defined functions.	L3
		C127.5	Examine the C program for mathematical operations using pointers.	L4
18EGH28	TECHNICAL ENGLISH-II	C128.1	Outline grammatical English, essentials of language skill, the nuances of phonetics, intonation and flawless pronunciation.	L2
		C128.2	Illustrate English vocabulary in language proficiency.	L3
		C128.3	Identify common errors in spoken and written communication.	L3
		C128.4	Develop and improve nonverbal communication kinesics.	L3
		C128.5	Organize well in campus recruitment, engineering and all other general competitive examinations.	L3
18MAT31	TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES	C231.1	Use Laplace transform and inverse Laplace transform in solving differential/ integral equations arising in network analysis, control systems and other fields of engineering.	L3
		C231.2	Demonstrate Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing and field theory.	L3

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		C231.3	Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems.	L3
		C231.4	Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.	L3
		C231.5	Determine the externals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.	L3
18CS32	DATA STRUCTURES AND APPLICATIONS	C232.1	Describe the fundamentals of data structures and their applications essential for programming/problem solving.	L2
		C232.2	Interpret linear Data Structures: Stack, Queues and Recursion.	L2
		C232.3	Illustrate the operations of types of Linked lists.	L3
		C232.4	Demonstrate primitive operations on different types of trees and their applications.	L3
		C232.5	Implement the concepts of Hashing, Files and their Organization and Sorting Algorithms.	L3
18CS33	ANALOG AND DIGITAL ELECTRONICS	C233.1	Summarize the application of analogy circuits using photo devices, timer IC, power supply and regulator IC and op-amp.	L2
		C233.2	Relate digital circuits using Karnaugh Map, and Quine-McCluskey Methods.	L2
		C233.3	Illustrate combinational and sequential digital circuits.	L3
		C233.4	Develop Gates and flip flops and make use in designing different data processing circuits, registers and counters and compare the types and develop simple HDL programs.	L3
		C233.5	Demonstrate registers and counters and its design.	L3
18CS34	COMPUTER ORGANIZATION S	C234.1	Outline the basic organization of a computer system.	L2
		C234.2	Relate functioning of different sub systems, such as processor, Input/output, and memory.	L2
		C234.3	Illustrate hardwired control and micro programmed control, pipelining, embedded and	L3



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			other computing systems.	
		C234.4	Inspect simple arithmetic and logical units.	L3
		C234.5	Examine the concepts of Basic Processing Units.	L3
18CS35	SOFTWARE ENGINEERING	C235.1	Outline software engineering principles and activities involved in building large software programs. Identify ethical and professional issues and explain why they are of concern to software engineers	L2
		C235.2	Summarize the fundamentals of object oriented concepts.	L2
		C235.3	Organize the process of requirements gathering, classification, specification, validation and differentiate system models, use UML diagrams and apply design patterns.	L3
		C235.4	Illustrate the distinctions between validation testing and defect testing.	L3
		C235.5	Articulate the importance of software maintenance and describe the intricacies involved in software evolution.	L3
		C236.1	Use Propositional and Predicate logic in Knowledge representation and truth verification.	L2
		C236.2	Demonstrate the application of discrete structures in different fields of computer science.	L3
18CS36	DISCRETE MATHEMATICAL STRUCTURES	C236.3	Solve problems using recurrence relations and generating functions.	L3
		C236.4	Choose application of different mathematical proof techniques in proving theorems in the courses.	L3
		C236.5	Compare graphs, trees and their applications.	L3
		C237.1	Develop practical experience in design, assembly and evaluation/testing of analog components and circuits including operational Amplifier, Timer, etc.	L4
18CSL37	ANALOG AND DIGITAL ELECTRONICS LABORATORY	C237.2	Use appropriate design equations / methods to design the given circuit.	L4
		C237.3	Examine and verify the design of both analog and digital circuits using simulators.	L4
		C237.4	Identify electronic components, ICs, instruments, and tools for design and testing of circuits for the	L4

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			given the appropriate inputs.	
		C237.5	Compile a laboratory journal which includes; aim, tool/instruments/software/components used, design equations used and designs, schematics, program listing, procedure followed, relevant theory, results as graphs and tables, interpreting and concluding the findings.	L4
18CSL38	DATA STRUCTURES LABORATORY	C238.1	Analyse the problems using arrays and strings.	L4
		C238.2	Illustrate linear Data structures-Stacks, Queues.	L4
		C238.3	Examine the working of Linked lists.	L4
		C238.4	Implement searching in Trees.	L4
		C238.5	Determine Graphs and hashing Techniques.	L4
18KAK39	ADALITHA KANNADA	C239.1	Learn and understand the Kannada language Kannada grammar.	L2
		C239.2	Understand kannada language rules and special symbols.	L2
		C239.3	Learn and write all types of letter writing.	L2
		C239.4	Students are able to learn and write easy writing.	L2
		C239.5	Learn and understand the Kannada language with the different words used for communication.	L2
18KVK39	VYAVAHARIKA KANNADA	C239.1	Open the barriers between people: barriers cause distrust and fear.	L2
		C239.2	Opens the door to art, music, dance, fashion, cuisine, film, philosophy, scienc..etc.	L2
		C239.3	Leads to an appreciation of cultural diversity.	L2
		C239.4	Encourages the respect for other people.	L2
		C239.5	It fosters an understanding of the interrelation of language and human nature.	L2
18MAT41	COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS	C241.1	Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.	L2
		C241.2	Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing.	L2
		C241.3	Apply 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	L3



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			the statistical data.	
		C241.5	Construct joint probability distributions and demonstrate the validity of testing the hypothesis.	L3
18CS42	DESIGN AND ANALYSIS OF ALGORITHMS	C242.1	Outline the method of analyzing the algorithm and performance using asymptotic notation.	L2
		C242.2	Develop the recursive and non-recursive algorithms using divide and conquer.	L3
		C242.3	Solve Problem using Greedy method and transform and conquer method.	L3
		C242.4	Interpret the algorithm design techniques using dynamic programming and time space tradeoff.	L3
		C242.5	Implement algorithm design techniques using backtracking, branch and bound and introduce NP-complete and NP-hard problems.	L3
18CS43	OPERATING SYSTEMS	C243.1	Describe the significance of the operating system, process and its services.	L2
		C243.2	Outline the concepts of threads, CPU Scheduling and mechanisms for synchronization.	L2
		C243.3	Illustrate concepts related to deadlock and memory management.	L2
		C243.4	Relate appropriate memory management and file management schemes.	L2
		C243.5	Examine secondary storage structure, protection and case study of Linux operating system.	L2
18CS44	MICROCONTROLLER AND EMBEDDED SYSTEMS	C241.1	Describe the architectural features and instructions of ARM microcontroller.	L2
		C244.2	Apply the knowledge gained for Programming ARM for different applications.	L3
		C244.3	Interface external devices with ARM microcontroller and interpret the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.	L3
		C244.4	Demonstrate the hardware /software co-design, firmware design approaches and examine need of real time operating system for embedded system applications.	L3
		C244.5	Illustrate the need of real time operating system	L3

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			for embedded system.	
18CS45	OBJECT ORIENTED CONCEPTS	C245.1	Outline the basics of object-oriented programming using C++ and JAVA.	L2
		C245.2	Interpret the concept of classes, Java, JDK Components and develop Simple Java Programs.	L2
		C245.3	Illustrate the Java Programs using inheritance and Exception handling.	L2
		C245.4	Develop programs using Multi-threading and Interfaces.	L3
		C245.5	Implement GUI applications using Applet classes, Swing components and Event handling programs.	L3
18CS46	DATA COMMUNICATION	C246.1	Describe the various components of data communication.	L2
		C246.2	Summarize the Fundamentals of digital communication and switching.	L2
		C246.3	Articulate switching and Error detection and correction.	L2
		C246.4	Compare and contrast data link layer protocols.	L3
		C246.5	Explain IEEE 802.X Standards.	L3
18CSL47	DESIGN AND ANALYSIS OF ALGORITHM LABORATORY	C247.1	Design and implement various algorithms in JAVA	L4
		C247.2	Implement a variety of sorting algorithms such as quick sort and Merge sort.	L4
		C247.3	Develop algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.	L4
		C247.4	Illustrate various design strategies and Algorithms for problem solving.	L4
		C247.5	Implement a variety of algorithms such as graph related, combinatorial, etc., in a high level language.	L4
18CSL48	MICROPROCESSORS LABORATORY	C248.1	Examine ARM7 instruction set and gain the knowledge how assembly language works.	L2
		C248.2	Develop and implement the program written in ARM7 assembly language instructions.	L3
		C248.3	Analyze the functioning of hardware devices and interfacing them into ARM7 Processor.	L3
		C248.4	Conduct and Test on an ARM7TDMI/LPC2148 evaluation board using evaluation version of	L3

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			Embedded 'C' & Keil Uvision-4 tool/compiler.	
		C248.5	Illustrate the need of real time operating system for embedded system.	L3
18CPH49	CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND HUMAN RIGHTS	C249.1	Demonstrate in details with examples to assimilate and get familiarized with basic information about Indian constitution.	L2
		C249.2	Organize in details with examples provide overall legal literacy to the young technocrats to manage complex societal issues in the present scenario.	L3
		C249.3	Develop the characteristics of individual roles and ethical responsibilities towards society.	L3
		C249.4	Build in depth to understand engineering ethics & responsibilities.	L3
		C249.5	Deliberate in details with application, if applicable, to understand engineering ethics & responsibilities, through the learning of these topics students will be able to understand human rights/ values and its implications in their life.	L3
18CS51	MANAGEMENT AND ENTREPRENEURSHIP FOR IT INDUSTRY	C351.1	Describe the principles of management, organization and entrepreneur.	L2
		C351.2	Summarize on planning, staffing, ERP and their importance.	L2
		C351.3	Make use of project report and its importance.	L3
		C351.4	Recognize the meaning of Entrepreneur and its process.	L3
		C351.5	Articulate the importance of intellectual property rights and relate the institutional support.	L3
18CS52	COMPUTER NETWORKS AND SECURITY	C352.1	Outline principles of application layer protocols.	L2
		C352.2	Recognize transport layer services and infer UDP and TCP protocols.	L2
		C352.3	Classify routers, IP and Routing Algorithms in network layer.	L2
		C352.4	Illustrate the Wireless and Mobile Networks covering IEEE 802.11 Standard.	L2
		C352.5	Extend Multimedia Networking and Network Management.	L2
18CS53	DATABASE MANAGEMENT SYSTEM	C353.1	Summarize the concept of database objects and ER model.	L2
		C353.2	Select Structured Query Language (SQL) for	L3

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			database manipulation.	
		C353.3	Build simple real-world database systems and applications using GUI.	L3
		C353.4	Implement normalization algorithms using database design theory for different Applications.	L3
		C353.5	Examine transaction processing, concurrency control and database recovery protocols in databases.	L4
18CS54	AUTOMATA THEORY AND COMPUTABILITY	C354.1	Outline the fundamentals of the core concepts in automata theory and Theory of Computation.	L2
		C354.2	Illustrate how to translate between different models of Computation (e.g., Deterministic and Non-deterministic and Software models).	L3
		C354.3	Analyze pumping lemma for regular languages and context free languages.	L3
		C354.4	Develop skills in formal reasoning and reduction of a problem to a formal model, with an emphasis on semantic precision and conciseness.	L3
		C354.5	Relate a problem with respect to different models of Computation.	L3
18CS55	APPLICATION DEVELOPMENT USING PYTHON	C355.1	Outline the syntax , semantics flow control and Functions in Python.	L2
		C355.2	Illustrate Python programs using Core data structures like Lists, Dictionaries, and use of String Handling methods.	L3
		C355.3	Develop Python programs using File Operations and searching pattern using regular expressions.	L3
		C355.4	Interpret the concepts of object oriented programming using Python.	L3
		C355.5	Examine the need for scraping websites and working with CSV, JSON and other file formats.	L3
18CS56	UNIX PROGRAMMING	C356.1	Summarize the UNIX Architecture, file system and basic Unix commands.	L2
		C356.2	Outline the shell programming concepts in real time problems.	L2
		C356.3	Select the UNIX File and Process system calls on problems.	L3
		C356.4	Choose the application/service concepts over a Unix system.	L3

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		C356.5	Illustrate the working of Signals and Daemon Processes.	L3
18CSL57	COMPUTER NETWORK LABORATORY	C357.1	Analyze the working of networking protocols using modern tool NS2.	L3
		C357.2	Develop wired and wireless topology using XGraph, NAM in NS2.	L3
		C357.3	Simulate the performance of GSM and CDMA.	L4
		C357.4	Implement the algorithms in data link layer, Network layer and application layer.	L3
		C357.5	Design client-server applications using TCP and UDP socket IPC.	L4
18CSL58	DBMS LABORATORY WITH MINI PROJECT	C358.1	Create, update and query on the database using SQL commands.	L5
		C358.2	Select database schema for a given problem-domain.	L3
		C358.3	Implement SQL programming through a variety of database problems.	L3
		C358.4	Demonstrate concepts of normalization to design an optimal database.	L4
		C358.5	Develop database applications using front-end tools and back-end DBMS.	L3
18CIV59	ENVIRONMENTAL STUDIES	C359.1	Describe the principles of ecosystem and Bio diversity.	L2
		C359.2	Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the Natural Resource Management and Energy Systems.	L3
		C359.3	Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components.	L4
		C359.4	Apply their ecological knowledge to illustrate and describe the realities in Global Environmental Concerns.	L3
		C359.5	Illustrate the latest Developments in Environmental Pollution Mitigation Tools.	L3
18CS61	SYSTEM SOFTWARE & COMPILERS	C361.1	Outline the system software such as assemblers and microprocessors.	L2
		C361.2	Describe the system software such as assemblers and loaders.	L2

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		C361.3	Illustrate top down and bottom up parsers.	L3
		C361.4	Examine the usage of lex and yacc tools.	L4
		C361.5	Interpret SDD, SDT, intermediate code generation and machine code generation.	L2
18CS62	COMPUTER GRAPHICS AND VISUALIZATION	C362.1	Design and implement algorithms for 2D graphics primitives and attributes.	L3
		C362.2	Illustrate Geometric transformations on both 2D and 3D objects.	L3
		C362.3	Apply concepts of clipping in 2D viewing and Illumination Models.	L3
		C362.4	Interpret concepts of visible surface detection in 3D viewing.	L2
		C362.5	Identify the representation of curves and surfaces.	L3
18CS63	WEB TECHNOLOGY AND ITS APPLICATIONS	C363.1	Outline HTML and CSS syntax and semantics to build web pages.	L2
		C363.2	Construct and visually format tables and forms using HTML and CSS.	L3
		C363.3	Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.	L3
		C363.4	Interpret the principles of object oriented development using PHP.	L2
		C363.5	Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features.	L4
18CS641	DATA MINING AND DATA WAREHOUSING	C364.1	Outline Data Warehouses, Operational Data Stores (ODS) and OLAP characteristics.	L2
		C364.2	Summarize the data mining concept, application and their usage.	L2
		C364.3	Illustrate the frequent patterns using association analysis algorithms like apriori, FP-growth etc.	L3
		C364.4	Apply the concept of classification, different classification algorithms and their applications.	L3
		C364.5	Interpret the concept of clustering and different cluster analysis methods.	L2



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18EE653	RENEWABLE ENERGY RESOURCES	C365.1	Describe causes of energy scarcity and its solution, energy resources and availability of renewable energy.	L2
		C365.2	Outline energy from sun, energy reaching the Earth's surface and solar thermal energy applications. Discuss types of solar collectors, their configurations, solar cell system, its characteristics and their applications.	L2
		C365.3	Explain generation of energy from hydrogen, wind, geothermal system, solid waste and agriculture refuse.	L2
		C365.4	Build production of energy from biomass, biogas.	L3
		C365.5	Summarize tidal energy resources, sea wave energy and ocean thermal energy.	L2
18CSL66	SYSTEM SOFTWARE LABORATORY	C366.1	Outline Lexical Analysis and Syntax Analysis phases of Compiler Design.	L2
		C366.2	Implement programs on these phases using LEX & YACC tools and/or C/C++/Java.	L3
		C366.3	Interpret different types of CPU scheduling algorithms used in the operating systems.	L2
		C366.4	Develop memory management - page replacement and deadlock handling algorithms.	L4
		C366.5	Utilize lex and yacc tools for implementing different concepts of system software.	L3
18CSL67	COMPUTER GRAPHICS LABORATORY WITH MINI PROJECT	C367.1	Demonstrate simple algorithms using OpenGL Graphics Primitives and attributes.	L4
		C367.2	Implementation of line drawing algorithm using OpenGL.	L3
		C367.3	Sketch line drawing clipping algorithms using OpenGL functions.	L4
		C367.4	Design and implementation of algorithms Geometric transformations on 2D objects.	L4
		C367.5	Interpret of algorithms Geometric transformations on 3D objects.	L4
18CSMP68	MOBILE APPLICATION DEVELOPMENT	C368.1	Build an application using Android development environment.	L3
		C368.2	Experiment with the method of storing, sharing and retrieving the data in Android Applications.	L4
		C368.3	Examine responsive user interface across wide	L4

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			range of devices.	
		C368.4	Develop mobile Application by using various components like activity, views, services, content providers and receivers.	L4
		C368.5	Create a mobile Application by using various components like Permissions, Performance and Security.	L4
18CS642	OBJECT ORIENTED MODELING AND DESIGN	C369.1	Describe the concepts of object-oriented and basic class modeling.	L2
		C369.2	Draw Use case modeling diagrams to solve problems.	L4
		C369.3	Illustrate the system conception and domain analysis in preparing a problem statement.	L3
		C369.4	Implement use case realization in the design discipline within iterations.	L3
		C369.5	Choose and apply a benefitting design pattern for the given problem.	L3
18CS643	CLOUD COMPUTING AND ITS APPLICATIONS	C3610.1	Explain cloud computing, virtualization and classify services of cloud computing.	L2
		C3610.2	Illustrate architecture of cloud computing.	L3
		C3610.3	Describe the thread Programming and high-throughput computing.	L2
		C3610.4	Illustrate the Map-Reduce Programming.	L3
		C3610.5	Interpret the platforms for development of cloud applications and List the application of cloud.	L3
18CS644	ADVANCED JAVA AND J2EE	C3611.1	Interpret the need for advanced Java concepts like enumerations and collections in developing modular and efficient programs.	L3
		C3611.2	Build client-server applications and TCP/IP socket programs.	L3
		C3611.3	Illustrate database access and details for managing information using the JDBC API.	L3
		C3611.4	Describe how servlets fit into Java-based web application architecture.	L2
		C3611.5	Develop reusable software components using Java Beans.	L4
18CS645	SYSTEM MODELLING AND	C3612.1	Explain the basic concepts in modelling and simulation.	L2
		C3612.2	Apply statistical models to find system behaviour.	L3

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	SIMULATION	C3612.3	Choose appropriate methods for the generation of random numbers and test them for ideal statistical properties.	L3
		C3612.4	Utilize the process of input modelling.	L3
		C3612.5	Select the process of verification and validation models.	L3
18EE651	INDUSTRIAL SERVO CONTROL SYSTEMS	C3613.1	Explain the evolution and classification of servos, with descriptions of servo drive actuators, amplifiers, feedback transducers, performance, and troubleshooting techniques.	L2
		C3613.2	Describe mathematical equations for electric servo motors, both DC and brushless DC servo motors.	L2
		C3613.3	Illustrate the servo block diagrams and performance for electric and hydraulic drives.	L3
		C3613.4	Organize the servo drive components by their transfer function, to combine the servo drive building blocks into system block diagrams.	L4
		C3613.5	Explain perform indices and performance criteria for servo systems and discuss the mechanical considerations of servo systems.	L2
18EE652	PLC AND SCADA	C3614.1	Outline the history of PLC and describe the hardware components of PLC: I/O modules, CPU, memory devices, other support devices, operating modes and PLC programming.	L2
		C3614.2	Describe field devices Relays, Contactors, Motor Starters, Switches, Sensors, Output Control Devices, Seal-In Circuits, and Latching Relays commonly used with I/O module and Analyze PLC timer and counter ladder logic programs.	L2
		C3614.3	Explain the execution of data transfer instructions, data compare instructions and the basic operation of PLC closed-loop control system.	L2
		C3614.4	Summarize the operation of mechanical sequencers, bit and word shift registers, processes and structure of control systems and communication between the processes.	L2
		C3614.5	Extend the operation of mechanical sequencers,	L2

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			bit and word shift registers, processes and structure of control systems and communication between the processes.	
18EE654	INTRODUCTION TO DATA ANALYTICS	C3615.1	Outline data, its architecture and examples of data use.	L2
		C3615.2	Explain methods of descriptive analytics of data.	L2
		C3615.3	Describe the methods for multivariate analysis, data preparation and data transformation and reducing.	L2
		C3615.4	Explain techniques for clustering the data and pattern mining.	L2
		C3615.5	Identify the methods of predictive analytics, performance measures for regression and algorithms for regression.	L3
18ME651	NON CONVENTIONAL ENERGY SOURCES	C3616.1	Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.	L2
		C3616.2	Select the need of renewable energy resources, historical and latest developments.	L3
		C3616.3	Select the use of solar energy and the various components used in the energy production with respect to applications like-heating, cooling, desalination, power generation, drying, cooking etc.	L3
		C3616.4	Construct the need of Wind Energy and the various components used in energy generation and know the classifications.	L3
		C3616.5	Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations	L4
18ME652	WORLD CLASS MANUFACTURING	C3617.1	Summarize the recent trends in manufacturing.	L2
		C3617.2	Illustrate the relevance and basics of World Class Manufacturing.	L2
		C3617.3	Relate the customization of product for manufacturing.	L2
		C3617.4	Construct the implementation of new technologies.	L3
		C3617.5	Compare the existing industries with WCM industries.	L4

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18ME653	SUPPLY CHAIN MANAGEMENT	C3618.1	Develop the framework and scope of supply chain management.	L3
		C3618.2	Build and manage a competitive supply chain using strategies, models, techniques and information technology.	L3
		C3618.3	Identify the Warehouse Management Stores, Supply Chain Network Distribution and Network Design.	L3
		C3618.4	Plan the demand, inventory and supply and optimize supply chain network.	L3
		C3618.5	Select the emerging trends and impact of IT on Supply chain.	L3
18ME654	ADVANCED MATERIALS TECHNOLOGY	C3619.1	Explain the concepts and principles of advanced materials and manufacturing processes.	L2
		C3619.2	Outline the applications of all kinds of Industrial materials.	L2
		C3619.3	Describe the material selection concepts to select a material for a given application.	L2
		C3619.4	Explain nanotechnology and its characterization.	L2
		C3619.5	Summarize the behaviour and applications of smart materials, ceramics, glasses and non-metallic materials.	L2
18EC651	SIGNAL PROCESSING	C3620.1	Explain continuous time and discrete time signals and systems, in time and frequency domain.	L2
		C3620.2	Apply the concepts of signals and systems to obtain the desired parameter/ representation.	L3
		C3620.3	Analyse the given system and classify the system/arrive at a suitable conclusion.	L4
		C3620.4	Design analog/digital filters to meet given specifications.	L4
		C3620.5	Design and implement the analog filter using components/suitable simulation tools and the digital filter (FIR/IIR) using suitable simulation tools.	L4
18EC652	SENSORS AND SIGNAL CONDITIONING	C3621.1	Compare various types of sensors.	L2
		C3621.2	Describe the manufacturing process of sensors.	L2
		C3621.3	Choose the material properties required to make sensors.	L3
		C3621.4	Implement sensors specific to the end use	L3

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			application.	
		C3621.5	Design systems integrated with sensors.	L4
18EC653	VIRTUAL INSTRUMENTATION	C3622.1	Recognize the Graphical system design model and develop programs using the modern tools of Graphical programming & textual programming.	L2
		C3622.2	Develop a virtual instrumentation model using the front panel controls & indicators and loops.	L3
		C3622.3	Analyze, design the various array and matrix operations using Lab VIEW functions.	L4
		C3622.4	Evaluate the various forms of output Representations using graphs & charts.	L4
		C3622.5	Demonstrate Instrument Control, GPIB communication and other interfaces.	L4
		18EC654	MICROCONTROLLERS	C3623.1
C3623.2	Write 8051 Assembly level programs using 8051 instruction set.			L2
C3623.3	Explain the Interrupt system, operation of Timers/Counters and Serial port of 8051.			L2
C3623.4	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.			L2
C3623.5	Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051 using 8051 I/O ports.			L3
18EC655	BASIC VLSI DESIGN	C3624.1	Identify the CMOS layout levels, and the design layers used in the process sequence.	L2
		C3624.2	Describe the general steps required for processing of CMOS integrated circuits.	L2
		C3624.3	Illustrate static CMOS combinational and sequential logic at the transistor level.	L2
		C3624.4	Demonstrate different logic styles such as complementary CMOS logic, pass-transistor Logic, dynamic logic, etc.	L2



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		C3624.5	Interpret the need for testability and testing methods in VLSI.	L2
18CS71	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	C471.1	Outline the theory of Artificial intelligence and Machine Learning.	L2
		C471.2	Summarize the Knowledge representation issues and concept learning.	L2
		C471.3	Apply decision tree learning in artificial neural networks.	L3
		C471.4	Solve Bayesian learning using bayes theorem, naive bayes classifier and EM Algorithm.	L3
		C471.5	Illustrate Instance based learning in reinforcement learning.	L3
18CS72	BIG DATA AND ANALYTICS	C472.1	Outline the fundamentals of Big Data analytics.	L2
		C472.2	Interpret Hadoop framework and Hadoop Distributed File system. Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.	L2
		C472.3	Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.	L2
		C472.4	List Machine Learning algorithms for real world big data.	L2
		C472.5	Relate web contents and Social Networks to provide analytics with relevant visualization tools.	L2
18CS733	ADVANCED COMPUTER ARCHITECTURES	C473.1	Describe the parallelism and principles of scalable computer.	L2
		C473.2	Identify the types of processors and Memory Architecture.	L2
		C473.3	Illustrate the performance of pipelining processors.	L2
		C473.4	Explain the techniques in multi computers and multiprocessors.	L2
		C473.5	Summarize parallel architecture and the software used for them.	L2
18CS742	NETWORK MANAGEMENT	C474.1	Describe the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets.	L2
		C474.2	Extend network management standards to	L2

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			manage practical networks.	
		C474.3	Illustrate the functions SNMP for managing the network and RMON for monitoring the behavior of the network.	L2
		C474.4	Select possible approaches for managing OSI network model.	L3
		C474.5	Identify the various components of network and understand the scheme for the managing them.	L3
18EC752	NUERAL NETWORKS	C475.1	Outline the basics of ANN and comparison with Human brain.	L2
		C475.2	Summarize knowledge on Generalization and function approximation of various ANN architectures.	L2
		C475.3	Develop reinforcement learning using neural networks	L3
		C475.4	Build knowledge of unsupervised learning using neural networks.	L3
		C475.5	Apply the concept of self-growing feature map.	L3
18CSL76	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY	C476.1	Implement and Demonstrate Heuristic Searching Algorithms using Python.	L3
		C476.2	Implement and Demonstrate Concept - Learning Algorithms.	L3
		C476.3	Implement Back propagation Algorithm by building an Artificial Neural Network.	L3
		C476.4	Demonstrate Bayesian Classifier Algorithms.	L4
		C476.5	Demonstrate Instance - Based Learning Algorithms.	L4
18CS77	PROJECT PHASE -I	C477.1	Survey on various technological domains.	L5
		C477.2	Identify the problem & its objectives.	L3
		C477.3	Formulate different requirements and Design system architecture, DFD, Class diagrams, Sequence diagrams and Flow charts for different modules.	L4
		C477.4	Build algorithms, code implementation, testing and validation.	L3
		C477.5	Work as a Team and Regular Interaction with Guide.	L5
18CS731	SOFTWARE ARCHITECTURE AND DESIGN PATTERNS	C478.1	Explain codes with higher performance and lower complexity.	L2
		C478.2	Summarize the code qualities needed to keep code flexible.	L2

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		C478.3	Examine core design principles and be able to assess the quality of a design with respect to these principles.	L3
		C478.4	Apply these principles in the design of object oriented systems.	L3
		C478.5	Demonstrate an understanding of a range of design patterns. Be capable of comprehending a design presented using this vocabulary.	L4
18CS732	HIGH PERFORMANCE COMPUTING	C479.1	Describe the parallel computing and parallel programming platforms.	L2
		C479.2	Illustrate principles of parallel algorithm Design, Basic Communication Operations and applications to high-performance computing systems.	L3
		C479.3	Apply programming using the message-passing Paradigm.	L3
		C479.4	Select the programming shared address space platforms.	L3
		C479.5	Organize the representation of Graph Algorithms.	L3
18CS734	USER INTERFACE DESIGN	C4710.1	Relate the importance and principles of user interface design.	L2
		C4710.2	Identify the User Interface Design process.	L3
		C4710.3	Select the various kinds of graphical menus and its functions.	L3
		C4710.4	Develop windows creation, operations and presentation styles.	L3
		C4710.5	Demonstrate menus and windows and other Screen based controls.	L4
18CS741	DIGITAL IMAGE PROCESSING	C4711.1	Explain fundamentals of image processing.	L2
		C4711.2	Describe image enhancement techniques in spatial domain.	L2
		C4711.3	Illustrate Image Enhancement In Frequency Domain.	L3
		C4711.4	Apply the Image Segmentation techniques.	L3
		C4711.5	Contrast image compression techniques.	L3
18CS743	NATURAL LANGUAGE PROCESSING	C4712.1	Outline the language modeling process and its applications.	L2
		C4712.2	Analyze the natural language text.	L2

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		C4712.3	Outline the importance of natural language.	L2
		C4712.4	Summarize the concepts Text mining.	L2
		C4712.5	Illustrate information retrieval techniques.	
18CS744	CRYPTOGRAPHY	C4713.1	Summarize the cryptography principles and the types of algorithms.	L2
		C4713.2	Illustrate the cryptography principles and the types of algorithms.	L2
		C4713.3	Describe public and private key cryptography.	L2
		C4713.4	Interpret Key management, distribution and certification.	L2
		C4713.5	Demonstrate authentication protocols, email security.	L2
18EE751	CARBON CAPTURE AND STORAGE	C4714.1	Describe the impacts of climate change and the measures that can be taken to reduce emissions.	L2
		C4714.2	Extend carbon capture and carbon storage.	L2
		C4714.3	Explain the fundamentals of power generation.	L2
		C4714.4	Relate methods of carbon capture from power generation and industrial processes.	L2
		C4714.5	Classify different carbon storage methods: storage in coal seams, depleted gas reservoirs and saline formations.	L2
18EE752	ELECTRIC VEHICLES	C4715.1	Summarize the roadway fundamentals, laws of motion, vehicle mechanics and propulsion system design.	L2
		C4715.2	Show the working of electric vehicles and hybrid electric vehicles in recent trends.	L2
		C4715.3	Model batteries, Fuel cells, PEMFC and super capacitors.	L3
		C4715.4	Select DC and AC drive topologies used for electric vehicle application.	L3
		C4715.5	Develop the electric propulsion unit and its control for application of electric vehicles.	L3
18EE753	DISASTERS MANAGEMENT	C4716.1	Summarize the need and significance of studying disaster management.	L2
		C4716.2	Describe the different types of disasters and causes for disasters.	L2
		C4716.3	Interpret the knowledge on the impacts Disasters on environment and society	L2
		C4716.4	Construct the vulnerability of a geographical area.	L3

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		C4716.5	Organize the various methods of risk reduction measures and risk mitigation.	L3
18EE754	ELECTRICAL ENERGY CONSERVATION AND AUDITING	C4717.1	Analyze about energy scenario nationwide and worldwide; also outline Energy Conservation Act and its features.	L2
		C4717.2	Describe load management techniques and energy efficiency.	L2
		C4717.3	Explain the need of energy audit methodology.	L2
		C4717.4	Relate various pillars of electricity market design.	L2
		C4717.5	Inspect energy audit of electrical systems and buildings.	L4
18ME751	ENERGY AND ENVIRONMENT	C4718.1	Outline energy scenario, energy sources and their utilization.	L2
		C4718.2	Summarize various methods of energy storage, energy management and economic analysis.	L2
		C4718.3	Describe the awareness about environment and eco system.	L2
		C4718.4	Select the environment pollution along with social issues and acts.	L3
		C4718.5	Identify the e-waste management and Air pollution control systems.	L3
18ME752	AUTOMOTIVE ENGINEERING	C4719.1	Summarize the different parts of an automobile and its working.	L2
		C4719.2	Outline the working of transmission and braking systems.	L2
		C4719.3	Explain the working of steering and suspension systems and their applications.	L2
		C4719.4	Select the various types of fuels and injection systems. Analyse the cause of automobile emissions, its effects on environment and methods to reduce the emissions.	L3
		C4719.5	Compare the different air pollutants and automotive emission controls.	L3
18ME753	INDUSTRIAL SAFETY	C4720.1	Outline the basic safety terms and international standards.	L2
		C4720.2	Identify the hazards and risk analysis around the work environment and industries.	L2
		C4720.3	Illustrate the safe measures while performing work in and around the work area of the available	L2

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			laboratories. Able to recognize the sign boards and its application.	
		C4720.4	Show the types of fires extinguishers and to demonstrate the portable extinguishers used for different classes of fires.	L2
		C4720.5	Develop the case studies by sharing experience of the employees working in housekeeping, laboratories like workshops, electrical labs, machine shops, electronics and computer laboratories.	L3
18ME754	OPTIMISATION TECHNIQUES	C4721.1	Summarize the optimization terminology, concepts, and understand how to classify an optimization problem.	L2
		C4721.2	Classify an optimization problem.	L2
		C4721.3	Apply the mathematical concepts formulate the problem of the systems.	L3
		C4721.4	Develop the problems for optimal solution using the algorithms.	L3
		C4721.5	Identify the optimum solution.	L3
18EC751	COMMUNICATION THEORY	C4722.1	Describe operation of communication systems.	L2
		C4722.2	Summarize the techniques of Amplitude and Angle modulation.	L2
		C4722.3	Outline the concept of sampling and quantization.	L2
		C4722.4	Explain the concepts of different digital modulation techniques.	L2
		C4722.5	Describe the principles of wireless communications system.	L2
18EC752	NEURAL NETWORKS	C4723.1	Extend the basics of ANN and comparison with Human brain.	L2
		C4723.2	Summarize the role of neural networks in engineering, artificial intelligence, and cognitive modelling.	L2
		C4723.3	Demonstrate the concepts and techniques of neural networks through the study of the most important neural network models.	L2
		C4723.4	Experiment with whether neural networks are appropriate to a particular application.	L3
		C4723.5	Apply neural networks to particular application, and to know what steps to take to improve	L3



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			performance.	
18EC753	ARM EMBEDDED SYSTEMS	C4724.1	Show the organization, architecture, bus technology, memory and operation of the ARM processors.	L2
		C4724.2	Relate the knowledge of Instruction set of ARM processors to develop basic Assembly Language Programs.	L2
		C4724.3	Outline the importance of the Thumb mode of operation of ARM processors.	L2
		C4724.4	Describe the techniques involved in writing C code for ARM processors and Exception & Interrupt handling in ARM Processors.	L2
		C4724.5	Develop the importance and use of Firmware, OS and cache in ARM Embedded systems.	L2
18EC754	DIGITAL SYSTEMS DESIGN USING VHDL	C4725.1	Summarize the basic concepts of Digital Design.	L2
		C4725.2	Implement various Combinational and sequential circuits using VHDL descriptions.	L3
		C4725.3	Design and verify the functionality of digital circuits (PLA, PAL, PLD) and Arithmetic Operations.	L3
		C4725.4	Identify the suitable Abstraction level for a particular digital design.	L3
		C4725.5	Select the programs more effectively using Verilog tasks and directives. Perform timing and delay Simulation.	L3
18CS81	INTERNET OF THINGS	C481.1	Interpret the impact and challenges posed by IoT networks leading to new architectural models.	L2
		C481.2	Compare the deployment of smart objects and the technologies to connect them to network.	L2
		C481.3	Develop the role of IoT protocols for efficient network communication.	L2
		C481.4	Describe the need for Data Analytics and Security in IoT.	L2
		C481.5	Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.	L2
18CS822	STORAGE AREA NETWORKS	C482.1	Describe the fundamentals of storage centric and server centric systems.	L2
		C482.2	Analyze the Technologies used for Designing	

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			storage area networks.	
		C482.3	Explain the Backup, Archive and Replication.	L2
		C482.4	Extend Cloud Computing and virtualization concepts.	L2
		C482.5	Apply the techniques used for Securing and Managing Storage Infrastructure.	L3
18CSP83	PROJECT WORK PHASE II	C483.1	Survey the changes in the technologies relevant to the topic selected.	L4
		C483.2	Discuss the technology and interpret the impact on the society.	L5
		C483.3	Discuss the technology and interpret the impact on the environment.	L5
		C483.4	Discuss the technology and interpret the impact on the domain.	L5
		C483.5	Compile report of the study and present to the audience, following the ethics.	L5
18CSS84	TECHNICAL SEMINAR	C484.1	Survey the changes in the technologies relevant to the topic selected.	L4
		C484.2	Discuss the technology and interpret the impact on the domain.	L4
		C484.3	Interpret the impact of the technology on the society and environment.	L4
		C484.4	Compile report of the study.	L4
		C484.5	Present to the audience, following the ethics.	L4
18CSI85	INTERNSHIP / PROFESSIONAL PRACTISE	C485.1	Adapt easily to the industry environment.	L2
		C485.2	Take part in team work.	L4
		C485.3	Make use of modern tools.	L3
		C485.4	Decide upon project planning and financing.	L4
		C485.5	Adapt ethical values.	L4
18CS821	MOBILE COMPUTING	C486.1	Explain state of art techniques in wireless communication.	L2
		C486.2	Discover GPRS, CDMA,GSM, Mobile IP and Wimax	L2
		C486.3	Describe Mobile OS and Computing Environment and Smart Client Architecture.	L2
		C486.4	Describe Wireless Internet Applications.	L2
		C486.5	Demonstrate program for CLDC, MIDP let model and security concerns.	L2
18CS23	NOSQL DATABASE	C487.1	Compare and use the four types of NoSQL Databases (Document-oriented, Key Value Pairs,	L2

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			Column-oriented and Graph).	
		C487.2	Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.	L2
		C487.3	Explain Basic Map-Reduce and its types.	L2
		C487.4	Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.	L2
		C487.5	Describe Graph Databases Features , Consistency, Transactions, Availability and Query Features.	L2
18CS824	MULTICORE ARCHITECTURE AND PROGRAMMING	C488.1	Identify the limitations of ILP and the need for multicore architectures.	L2
		C488.2	Summarize fundamental concepts of parallel programming and its design issues.	L2
		C488.3	Explain the issues related to multiprocessing and suggest solutions.	L2
		C488.4	Outline the salient features of different multicore architectures and how they exploit parallelism.	L2
		C488.5	Demonstrate the role of OpenMP and programming concept	L2

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