LENDI INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
(Approved by A.I.C.T.E & Affiliated to JNTUGV, Vizianagaram)
Accredited by NAAC with "A" Grade & NBA
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

List of Course Outcomes (CO)

Regulations: R23 **Branch: CSM**

COURSECODE &NAME	CO	CO STATEMENT
SEMESTER-1 (I-I)-R23		
C101 LINEAR ALGEBRA & CALCULUS	**C101.1**	Apply the Methods for solving linear equations to engineering applications.
	C101.2	Apply the concepts of eigen values and eigen vectors to free vibration of a two mass system.
	C101.3	Apply mean value theorems to real world problems.
	C101.4	Find maxima and minima of functions of several variables.
	C101.5	Evaluate the volume and surface area of solids using multiple integrals.
C102 ENGINEERING PHYSICS	**C102.1**	Analyse the intensity variation of light due to polarization, interference and diffraction.
	C102.2	Identify the crystals structures with X-Ray diffraction principles.
	C102.3	Classify the various types of magnetic and dielectrics materials.
	C102.4	Explain the basic concepts of Quantum Mechanics and the band theory of solids.
	C102.5	Recognize the type of semiconductors using Hall Effect.
C103 COMMUNICATIVE ENGLISH	**C103.1**	Learn how to understand the context, topic, and specific information from social or transactional dialogues.
	C103.2	Learn remedially to apply grammatical structures to formulate sentences and use appropriate words and correct word forms.
	C103.3	Improve communicative competence in formal and informal contexts and for social and academic purposes
	C103.4	Critically comprehend and appreciate reading /listening texts and write summaries based on global comprehension of these texts.
	C103.5	Write coherent paragraphs, essays, letters/emails and resumes.
C104 BASIC CIVIL & MECHANICAL ENGINEERING	**C104.1**	Understand the disciplines of Civil Engineering and their role in development of the society.
	C104.2	Apply the concepts of surveying for the measurement of distances, angles and levels
	C104.3	Explain the key elements of Transportation Engineering, Water Resources and

	C104.4	Explain the key elements of Transportation Engineering, Water Resources and Environmental Engineering
C105 INTRODUCTION TO PROGRAMMING	**C105.1**	Understand basics of computers, the concept of algorithm and problem solving analysis.
	C105.2	Understand the concepts of control structures, branching and looping statements.
	C105.3	Apply the concepts of arrays in solving complex problems.
	C105.4	Develop programs on modular programming using functions and strings.
	C105.5	Develop an ability to debug and optimize the code and solve real time problem statements
C106 COMMUNICATIVE ENGLISH LAB	**C106.1**	Understand the different aspects of the English language oral communication with emphasis on Listening and Speaking Skills.
	C106.2	Apply communication skills through various language learning activities.
	C106.3	Analyze the English speech sounds, stress, rhythm and intonation for better listening and speaking comprehension.
	C106.4	Evaluate and exhibit professionalism in participating in debates and group discussions with polite turn-taking strategies and sound more professional while communicating with others
	C106.5	Create effective resonate and prepare them to face interviews and communicate appropriately in corporate settings. .
C107 ENGINEERING PHYSICS LAB	**C107.1**	Apply the working principles of laboratory experiments in optics, electrical and electronics.
	C107.2	Compute the required parameter by suitable formula using experimental values (observed values) in optics, electrical and electronic experiments
	C107.3	Analyze the experimental results through graphical interpretation
	C107.4	Recognize the required precautions to carry out the experiment and handling the apparatus in the laboratory.
	C107.5	Demonstrate the working principles, procedures and applications.
C108 ENGINEERING WORKSHOP	**C108.1**	Identify workshop tools and their operational capabilities.
	C108.2	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
	C108.3	Apply fitting operations in various applications..
	C108.4	Apply basic electrical engineering knowledge for House Wiring Practice
	C108.5	Prepare the pipe joint with couplings for same diameter and with reduced diameters for the given application
C109 IT WORKSHOP	**C109.1**	Perform Hardware troubleshooting.
	C109.2	Understand Hardware components and inter dependencies.
	C109.3	Safeguard computer systems from viruses/worms.
	C109.4	Document/ Presentation preparation.
	C109.5	Perform calculations using spreadsheets.
C110	**C110.1**	Implement and execute the programs written in C language on

COMPUTER PROGRAMMING LAB		Windows and Linux OS.
	C110.2	Apply conditional and iterative statements to solve real time scenarios in C.
	C110.3	Develop C programs which utilize memory efficiently through arrays and strings.
	C110.4	Develop programs to demonstrate the applications through user defined datatypes.
	C110.5	Construct programs using structures, unions, and files.
C111 HEALTH AND WELLNESS, YOGA AND SPORTS	**C111.1**	Understand the importance of yoga and sports for Physical fitness and sound health.
	C111.2	Demonstrate an understanding of health-related fitness components.
	C111.3	Compare and contrast various activities that help enhance their health.
	C111.4	Assess current personal fitness levels.
	C111.5	Develop Positive Personality
SEMESTER-2 (I-II)-R23		
C112 DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS	**C112.1**	Solve the first order ordinary differential equations related to various engineering fields.
	C112.2	Solve the higher order differential equation and analyze physical situations
	C112.3	Solve partial differential equations of first order and higher order related to engineering applications.
	C112.4	Apply vector differential operators to the real world situations.
	C112.5	Estimate the work done against a field, circulation and flux using vector calculus.
C113 CHEMISTRY	**C113.1**	Categorize thermoplastics, thermos settings, elastomers conducting polymers and biodegradable polymers.
	C113.2	Determine the conductance and emf values of various solutions using conductivity meter and potentiometer. Compare the materials of construction for battery and electrochemical sensors.
	C113.3	Apply the principle of nanomaterials, semiconductors, superconductors, and super capacitors in preparing modern engineering materials.
	C113.4	Demonstrate the construction and working hydro, geothermal, tidal and ocean thermal power plants.
	C113.5	Understand the construction and working of UV-Visible Spectro photo meter, IR spectroscopy and HPLC chromatography techniques.
C114 ENGINEERING GRAPHICS	**C114.1**	Understand the basics of Engineering Graphics to construct the polygon, curves and scales.
	C114.2	Draw the orthographic projections of points and straight lines

		inclined to both the planes
	C114.3	Draw the projections of planes in various conditions.
	C114.4	Draw the projections of regular solids, with its axis inclined to one plane and sections of solids .
	C114.5	Visualize the 3D isometric views from 2D orthographic views and vice versa along with basic introduction to CAD.
C115 BASIC ELECTRICAL & ELECTRONICS ENGINEERING	**C115.1**	Understand the problem solving concepts associated to dc and ac circuits.
	C115.2	Understand the principle and operation of basic electrical machines and measuring instruments.
	C115.3	Identify the electricity bill calculations and layout representation of electrical power systems.
	C115.4	Understand the operation of various basic semiconductor devices.
	C115.5	Make use of the applications of semiconductor devices.
	C115.6	Analyze the different digital circuits.
C116 DATA STRUCTURES	**C116.1**	Understand algorithmic complexities of linear data structures.
	C116.2	Design, implement, and apply linked lists for dynamic data storage via dynamic memory allocation.
	C116.3	Apply stacks and queue model for real-world scenarios.
	C116.4	Understand the basic tree data structures and tree traversals.
	C116.5	Recognize scenarios where hashing is advantageous, and design hash-based solutions.
C117 CHEMISTRY LAB	**C117.1**	Determine the cell constant and conductance of different solutions.
	C117.2	Prepare advanced polymer Bakelite materials.
	C117.3	Measure the strength of an acid present in secondary batteries.
	C117.4	Determine the amount of acidity of a given sample.
	C117.5	Calculate strength of iron present in a given sample.
C118 ELECTRICL & ELECTRONICS ENGINEERING WORKSHOP	**C118.1**	Apply theoretical concepts to obtain calculations for the measurement of electrical parameters.
	C118.2	Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.
	C118.3	Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.
	C118.4	Summarize the characteristics of various electronic devices.
	C118.5	Analyze the different digital circuits.
	C118.6	Evaluate the electronic devices with simulation
C119 DATA STRUCTURES LAB	**C119.1**	Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
	C119.2	Design, implement, and apply linked lists for dynamic data storage.
	C119.3	Develop programs using stacks and queues to handle recursive algorithms.

	C119.4	Apply tree traversal algorithms using linked lists on binary trees and binary search trees.
	C119.5	Design hash-based solutions for specific problems like collision resolution techniques.
C120 NSS/NCC/SCOUTS &GUIDES/COMMUNITY SERVICE	**C120.1**	Understand the importance of discipline, character and service motto.
	C120.2	Solve some societal issues by applying acquired knowledge, facts, and techniques.
	C120.3	Explore human relationships by analyzing social problems.
	C120.4	Determine to extend their help for the fellow beings and downtrodden people.
	C120.5	Develop leadership skills and civic responsibilities.
SEMESTER-3 (II-I)-R23		
C201 Mathematical Foundations for Computer Science	**C201.1**	Analyze formal proofs using logical arguments through logical and analytical reasoning.
	C201.2	Apply the core concepts of sets, relations, functions to computer science and engineering.
	C201.3	Apply graph theory, tree theory, and algorithms to solve problems in computer science.
	C201.4	Apply the concepts of elementary number theory to cryptography.
	C201.5	Apply suitable methods to solve computational problems involving recurrence relations.
C202 UNIVERSAL HUMAN VALUES: UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	**C202.1**	Implement elements and process of value education.
	C202.2	Recognize thoughts, emotions and physical sensations of the self and the body and harmonizing their relationship.
	C202.3	Analyze human relations and their role in ensuring harmonious society.
	C202.4	Develop interconnected nature of existence encourages actions that contribute to global peace, justice and sustainability.
	C202.5	Make use of humanistic constitution, mutual respect and universal human order with holistic technologies.
C203 PRINCIPLES OF ARTIFICIAL INTELLIGENCE	**C203.1**	Understand the concepts of artificial intelligence.
	C203.2	Apply problem-solving strategies and perform search operations using heuristic techniques.
	C203.3	Summarize different knowledge representation techniques.
	C203.4	Apply the concepts of backward chaining using logic concepts.
	C203.5	Understand the architecture and role of expert system in AI.
C204 PYTHON PROGRAMMING	**C204.1**	Implement Basic Python Programming Fundamentals for Computation of Expression.
	C204.2	Apply Iterators and functions in data processing.
	C204.3	Understand modules and packages to leverage powerful libraries for data science tasks.
	C204.4	Implement sequences and data structures for data organization.

	C204.5	Implement object-oriented principles in Python, handling run-time errors.
C205 DATABASE MANAGEMENT SYSTEMS	**C205.1**	Design the ER model using the basic concepts of DBMS.
	C205.2	Apply SQL concepts to Construct simple and complex queries.
	C205.3	Analyze schema refinement techniques.
	C205.4	Understand transaction serializability and concurrency control.
	C205.5	Apply the B & B+ Trees concepts on database storage.
C206 PYTHON PROGRAMMING-LAB	**C206.1**	Design the ER model using the basic concepts of DBMS, and RDBMS.
	C206.2	Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
	C206.3	Implement Conditionals and Loops for Python Programs.
	C206.4	Use Python Lists, Tuples and Dictionaries for representing compound data.
	C206.5	Interpret the concepts of Object-Oriented Programming as used in Python
C207 DATABASE MANAGEMENT SYSTEMS LAB	**C207.1**	Implement DDL, DML, DCL and TCL commands with integrity constraints.
	C207.2	Apply SQL commands such as DDL, DML, DCL, and TCL with integrity constraints...
	C207.3	Applying String, Date, and Conversion Functions in DBMS.
	C207.4	Implement simple and nested queries.
	C207.5	Develop PL/SQL stored procedures, functions, cursors, and Triggers.
C208 ENGLISH FOR EMPLOYABILITY SKILLS (SKILL ORIENTED COURSE)	**C208.1**	Enable students to identify Parts of Speech and use them flawlessly, write Emails in formal correspondence effectively, participate confidently by introducing oneself in any formal discussion.
	C208.2	Attain Language Proficiency & Accuracy through Contextualized Vocabulary, Verb forms, Tense and subject-verb agreement, produce coherent expressions for professional writing, and introduce themselves unhesitatingly with Task-Based Activities.
	C208.3	Develop the fluency and accuracy to write Technical Reports and Emails for professional communication by using appropriate vocabulary and participating confidently in formal discussions.
	C208.4	Assimilate lifelong reading habits to comprehend a passage for its gist. Avoid errors in both Speech & Writing and write Letters and Emails for official communication. Realise the technical communicative competence and attainment of grammatically correct structures for formal communication.
C209 ENVIRONMENTAL SCIENCE (MANDATORY COURSE)	**C209.1**	Understand the significance of various natural resources, including renewable, non renewable water, minerals, forests and soil, in the environment and the problems associated with it in maintaining ecological balance and supporting human activities.
	C209.2	Apply strategies for mitigating different types of environmental

		pollution, managing solid waste effectively and adopt individual actions that contribute to pollution prevention and waste reduction.
	C209.3	Understand the structure, function, characteristic features of different kind of eco systems, value of biodiversity, threats to bio diversity and India's role and strategies in the conservation of biodiversity for sustainable development.
	C209.4	Apply the Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, and Forest Conservation Act to promote sustainable environmental development; Address related social issues and propose effective solutions, delving into the intersection of environmental policies and community welfare to achieve ultimate sustainability goals.
	C209.5	Identify the role of information technology in addressing population-related problems, focusing on resource management, environmental monitoring, urban planning, healthcare improvement, education to enhance sustainability and quality of life.
SEMESTER-4 (II-II)-R23		
C210 MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS	**C210.1**	Equipped with the knowledge of fundamentals of economics, estimating the Demand for a product, Capable of analyzing Elasticity & Forecasting methods.
	C210.2	Apply production concepts, assess the costs and Determine Break Even Point (BEP)of an enterprise for managerial decision making.
	C210.3	Identify the influence and price determination of various markets structures and knowledge of the forms of business organization and Business cycles.
	C210.4	Analyze how to invest adequate amount of capital in order to get maximum return from selected business activity.
	C210.5	Analyze and interpret the process & principles of accounting & apply financial statements for appropriate decisions to run the business profitably.
C211 PROBABILITY AND STATISTICS	**C211.1**	Apply descriptive statistical methods to summarize, visualize, and interpret data, enabling them to effectively communicate findings and insights in a data-driven context.
	C211.2	Apply linear regression models and correlation techniques to decision-making by examining relationships between variables.
	C211.3	Analyze real-world engineering problems using the concepts of probability theory and statistical distributions in the process of assessment and decision-making under uncertainty.
	C211.4	Analyze data effectively to ensure accurate representation of populations in engineering studies and facilitate decision-

		making based on statistical inference using large sample tests.
	C211.5	Analyze data effectively to ensure accurate representation of populations in engineering studies and facilitate decision-making based on statistical inference using small sample tests.
C212 MACHINE LEARNING	**C212.1**	Understand different types of machine learning algorithms.
	C212.2	Apply classification algorithms and regression algorithms.
	C212.3	Apply decision tree algorithms for classification and regression algorithms.
	C212.4	Apply supervised machine learning algorithms
	C212.5	Apply Unsupervised machine learning algorithms.
C213 JAVA PROGRAMMIG	**C213.1**	Understand the Environment of Java Run-time Environment and Control Structures.
	C213.2	Implement real-world objects using class Hierarchies.
	C213.3	Implement programs using a collection Framework.
	C213.4	Implement exception handling and file handling.
	C213.5	Design GUI for real-time problems.
C214 DIGITA LOGIC & COMPUTER ORGANIZATION	**C214.1**	Explain different combinational logic circuits for the realization of digital logic circuits.
	C214.2	Design and implement various synchronous and asynchronous sequential circuits using flip-flops.
	C214.3	Design digital circuits using PLDs (PLA, PAL, PROM), comprehend the fundamental structure and operation of computers.
	C214.4	Apply different addressing modes and I/O operations to optimize computational processes.
	C214.5	Illustrate the concepts of Memory and instruction Set execution in processing unit.
C215 JAVA PROGRAMMING LAB	**C215.1**	Understand the Environment of Java Run-time Environment and Control Structures.
	C215.2	Implement real-world objects using class Hierarchies.
	C215.3	Implement programs using a collection Framework.
	C215.4	Implement exception handling and file handling.
	C215.5	Design GUI for real-time problems.
C216 MACHINE LEARNING LAB	**C216.1**	Understand the statistical aspects of algorithms used in pre-processing.
	C216.2	Design and evaluate supervised models for classification.
	C216.3	Evaluate the machine learning models using unsupervised algorithms.
	C216.4	Design and apply clustering algorithms for refinement of the data.
	C216.5	Design, develop and test the performance of the machine learning model.
C217 NOSQL DATABASES (SKILL ORIENTED COURSE)	**C217.1**	Understand different types of NoSQL Databases
	C217.2	Compare RDBMS with NoSQL databases.
	C217.3	Understand performance tune of Key-Value Pair NoSQL databases.

	C217.4	Demonstrate NoSQL development tools on different types of NoSQL Databases
C218 DESIGN THINKING FOR INNOVATION	**C218.1**	Explain the fundamentals of Design Thinking and Innovation.
	C218.2	Apply the design thinking techniques for solving problems in various sectors.
	C218.3	Analyze to work in a multidisciplinary environment.
	C218.4	Evaluate the value of creativity.
	C218.5	Formulate specific problem statements of real time issues.
C219 ANGULAR JS FRAMEWORK **HONORS COURSE-1(TRACK-1)**	**C219.1**	Understand the fundamentals of Angular JS and its architecture.
	C219.2	Apply data binding objects for implementing modules.
	C219.3	Implement service and retrieve rest call data.
	C219.4	Understand routes and their configuration in angular.
	C219.5	Implement form handling with event driven apps.
SEMESTER-5 (III-I)-R23		
C301 DEEP LEARNING	**C301.1**	Apply the fundamentals of linear algebra to deep learning algorithms
	C301.2	Understand the fundamental building blocks of deep learning
	C301.3	Apply the concepts of Convolution Neural Networks to computer vision applications
	C301.4	Apply the concepts of Recurrent Neural Networks to Natural Language Process
	C301.5	Apply the regularization techniques to improve the model performance
C302 OPERATING SYSTEMS	**C302.1**	Understand the importance of operating systems and different types of system calls.
	C302.2	Analyse process scheduling algorithms and various IPC mechanisms.
	C302.3	Analyse the process synchronization, different ways for deadlocks handling.
	C302.4	Analyse different page replacement methods, various File management techniques.
	C302.5	Understand Android environment and behaviour.
C303 OBJECT ORIENTED SOFTWARE ENGINEERING	**C303.1**	Compare various Software Development Lifecycle Models.
	C303.2	Analyze requirements for different use cases.
	C303.3	Design use case diagrams for various case studies.
	C303.4	Apply different test cases and test strategies for different applications.
	C303.5	Analyze the project management activities.
C304 DEVOPS	**C304.1**	Compare the traditional IT practices with DevOps practices.
	C304.2	Apply CI/CD practices by designing and evaluating pipelines using tools such as Jenkins and GitLab CI.
	C304.3	Deploy and manage applications using Docker containers and orchestrate them with Kubernetes.
	C304.4	Analyze and implement configuration management and Infrastructure as Code automation using Ansible and Terraform.
	C304.5	Understand the Integration of monitoring and security tools in DevOps

C305 MICROPROCESSORS AND INTERFACING	**C305.1**	Outline the architecture and working diagram of 8085 microprocessors.
	C305.2	Interpret the 8086 functioning in minimum mode and maximum mode with its architecture, memory segmentation and organization.
	C305.3	Construct Assembly language program for 8086 using assembler directives, addressing modes and instruction set.
	C305.4	Develop Interface circuits with various peripheral control ICs for 8086 system.
	C305.5	Desing various memory interfacing Circuits with 8086 system.
C306 DEEP LEARNING LAB	**C306.1**	Apply numerical methods, matrix operations, and eigenvalue decomposition techniques using Python for data preparation and feature transformation.
	C306.2	Analyze and implement dimensionality reduction techniques such as Principal Component Analysis (PCA) to handle high-dimensional data.
	C306.3	Apply perception and multilayer neural network algorithms to classify basic logic gates and real-world datasets such as MNIST.
	C306.4	Design and implement advanced deep learning models including RNNs, LSTMs, BiLSTMs, and Auto encoders for text classification and anomaly detection.
	C306.5	Develop and evaluate convolution neural networks for image classification tasks using datasets like Fashion-MNIST.
C307 OPERATING SYSTEMS LAB	**C307.1**	Simulate various CPU process scheduling algorithms to analyze system performance.
	C307.2	Implement system calls for process creation, management, and inter-process communication.
	C307.3	Apply different memory management techniques including paging, segmentation, and allocation methods.
	C307.4	Simulate page replacement, banker's algorithm, and file allocation strategies to evaluate their efficiency.
	C307.5	Implement synchronization mechanisms in concurrent programming and demonstrate multithreading concepts for safe process execution.
C308 NODE JS AND EXPRESS JS (SKILL ORIENTED COURSE)	**C308.1**	Explain the architecture and features of Node.js and compare it with traditional web server technologies.
	C308.2	Utilize Node.js modules and the Node Package Manager (NPM) to structure and manage application dependencies.
	C308.3	Create and deploy server-side applications that handle HTTP requests and perform file system operations.
	C308.4	Develop web applications using Express.js, including routing, middleware integration, and static content delivery.
	C308.5	Implement CRUD operations with MongoDB and build RESTful APIs using Node.js and Express.js
C309 TINKERING LAB	**C309.1**	Apply prior knowledge to develop and conceptualize scientific methods and engineering techniques.
	C309.2	Analyze real-world problems through self-directed exploration and iterative experimentation.
	C309.3	Design and develop technical experiments or prototypes with available financial and mentoring support.
	C309.4	*Evaluate and refine self-initiated projects by learning from failures,*

		feedback, and performance metrics.
	C309.5	Create innovative, application-oriented solutions by integrating technical skills, creativity, and exploratory learning.
C310 ENGLISH AND SOFT SKILLS FOR JOB SEEKERS (MANDATORY COURSE)	**C310.1**	Understand the grammatical forms of English and the use of these forms in specific communicative and professional writing.
	C310.2	Improve their speaking ability in English, both in terms of fluency and comprehensibility by participating in Group discussions and oral assignments CO3: master interview skills for effective preparation and confident performance in diverse job scenarios.
	C310.3	Demonstrate confidence and professionalism in job interviews and workplace interactions by effectively applying practiced soft skills.
	C310.4	Demonstrate readiness for Higher education by effectively navigating its admission process
C311 DESIGN PATTERNS	**C311.1**	Distinguish between different categories of design patterns
	C311.2	Ability to identify appropriate patterns for design of given problem.
	C311.3	Ability to understand and apply common design patterns to incremental/iterative development.
	C311.4	Exploit well-known design patterns (such as Iterator, Observer, Factory and Visitor).
	C311.5	Design the software using Pattern Oriented Architectures.
312 EVALUATION OF COMMUNITY SERVICE PROJECT INTERNSHIP	**C312.1**	Creating interest in new avenues for research and publication via new relationships between faculty and community through self-learning
	C312.2	Providing networking opportunities with engaged faculty in other disciplines or institutions
	C312.3	Creating stronger commitment to one's research work.
	C312.4	Enhancing community relations through Valuable human resources needed to achieve community goals
	C312.5	Crating new energy, enthusiasm and perspectives applied to community work

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HOD CSM