Department of Computer Science Engineering

Program: B.Tech- Computer Science Engineering – AI & ML

Regulation: R20 **Course Outcomes** **No. of Courses: 84**

I-I Sem	Course: Communicative English
CO-1	Understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information.
CO-2	Ask and answer general questions on familiar topics and introduce one/other.
CO-3	Employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information.
CO-4	Recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs.
CO-5	Form sentences using proper grammatical structures and correct word forms.
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I-I Sem	Course: :Mathematics – I
CO-1	Utilize mean value theorems to real life problems.
CO-2	Uolve the differential equations related to various engineering fields.
CO-3	Familiarize with functions of several variables which is useful in optimization.
CO-4	Apply double integration techniques in evaluating areas bounded by region.
CO-5	Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems.

I-I Sem	Course: Applied Chemistry
CO-1	Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.
CO-2	Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.
CO-3	Synthesize nanomaterials for modern advances of engineering technology. Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors.
CO-4	Analyze the principles of different analytical instruments and their applications. Design models for energy by different natural sources.
CO-5	Obtain the knowledge of computational chemistry and molecular machines.

I-I Sem	Course: Programming For Problem Solving Using C
CO-1	To write algorithms and to draw flowcharts for solving problems.
CO-2	To convert flowcharts/algorithms to C Programs, compile and debug programs.

CO-3	To use different operators, data types and write programs that use two-way/ multi-way selection. To select the best loop construct for a given problem.
CO-4	To design and implement programs to analyze the different pointer applications
CO-5	To decompose a problem into functions and to develop modular reusable code To apply File I/O operations.
I-I Sem	**Course: Computer Engineering Workshop**
CO-1	Assemble and disassemble components of a PC
CO-2	Construct a fully functional virtual machine, Summarize various Linux operating system commands,
CO-3	Recognize characters & extract text from scanned images, Create audio files and podcasts
I-I Sem	**Course: English Communication Skills Lab**
CO-1	Better pronunciation and accent
CO-2	Ability to use functional English
CO-3	Competency in analytical skills and problem solving skills
I-I Sem	**Course: Applied Chemistry Lab**
CO-1	The students entering into the professional course have practically very little exposure to lab classes.
CO-2	The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis.
CO-3	Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments
I-I Sem	**Course: programming for problem solving using c lab**
CO-1	Gains Knowledge on various concepts of a C language.
CO-2	Able to draw flowcharts and write algorithms.
CO-3	Able design and development of C problem solving skills.
I-I Sem	**Course: :Environmental Science**
CO-1	Overall understanding of the natural resources.
CO-2	Basic understanding of the ecosystem and its diversity.

CO-3	Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
CO-4	An understanding of the environmental impact of developmental activities.
CO-5	Awareness on the social issues, environmental legislation and global treaties.
I-II Sem	**Course: :Mathematics – II**
CO-1	Develop the use of matrix algebra techniques that is needed by engineers for practical applications.
CO-2	Solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel.
CO-3	Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals.
CO-4	Apply numerical integral techniques to different Engineering problems.
CO-5	Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations.
I-II Sem	**Course: Applied Physics**
CO-1	Explain the need of coherent sources and the conditions for sustained interference (L2). Identify the applications of interference in engineering (L3). Analyze the differences between interference and diffraction with applications (L4). Illustrate the concept of polarization of light and its applications (L2). Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2)
CO-2	Explain various types of emission of radiation (L2). Identify the role of laser in engineering applications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify optical fibers based on refractive index profile and mode of propagation (L2). Identify the applications of optical fibers in medical, communication and other fields (L2). Apply the fiber optic concepts in various fields (L3).
CO-3	Describe the dual nature of matter (L1). Explain the significance of wave function (L2). Identify the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). Identify the role of classical and quantum free electron theory in the study of electrical conductivity (L3). Classify the energy bands of solids (L2).
CO-4	Explain the concept of dielectric constant and polarization in dielectric materials (L2). Summarize various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). Classify the magnetic materials based on susceptibility and their temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3).
CO-5	Outline the properties of charge carriers in semiconductors (L2). Identify the type of semiconductor using Hall effect (L2). Identify applications of semiconductors in electronic devices (L2). Classify superconductors based on Meissner's effect (L2). Explain Meissner's effect, BCS theory & Josephson effect in superconductors (L2).

I-II Sem	**Course: :Digital Logic Design**
CO-1	An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
CO-2	An ability to understand the different switching algebra theorems and apply them for logic functions.
CO-3	An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
CO-4	Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays.
CO-5	Students will be able to design various sequential circuits starting from flip-flop to registers and counters.
I-II Sem	**Course: :Python Programming**
CO-1	Develop essential programming skills in computer programming concepts like data types, containers.
CO-2	Apply the basics of programming in the Python language.
CO-3	Solve coding tasks related conditional execution, loops.
CO-4	Solve coding tasks related to the fundamental notions and techniques used in objectoriented programming
CO-5	Use various applications using python
I-II Sem	**Course: :Data Structures**
CO-1	Summarize the properties, interfaces, and behaviors of basic abstract data types.
CO-2	Discuss the computational efficiency of the principal algorithms for sorting & searching.
CO-3	Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs.
CO-4	To make the students draw the projections of the lines inclined to both the planes
CO-5	Demonstrate different methods for traversing trees.
I-II Sem	**Course: :Python Programming Lab**
CO-1	Write, Test and Debug Python Programs
CO-2	Use Conditionals and Loops for Python Programs
CO-3	Use functions and represent Compound data using Lists, Tuples and Dictionaries

I-II Sem	Course: :Data Structures Lab
CO-1	Use basic data structures such as arrays and linked list.
CO-2	Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
CO-3	Use various searching and sorting algorithms.
I-II Sem	**Course: :Applied Physics Lab**
CO-1	Develop skills to impart practical knowledge in real time solution.
CO-2	Understand principle, concept, working and application of new technology and comparison of results with theoretical calculations.
CO-3	Design new instruments with practical knowledge.
I-II Sem	**Course: :Constitution Of India**
CO-1	Understand historical background of the constitution making and its importance for building a democratic India.
CO-2	Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
CO-3	Understand the value of the fundamental rights and duties for becoming good citizen of India.
CO-4	Analyze the decentralization of power between central, state and local self-government.
CO-5	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy
II-I Sem	**Course: :Mathematics – III**
CO-I	Interpret the physical meaning of different operators such as gradient, curl and divergence
CO-2	Estimate the work done against a field, circulation and flux using vector calculus
CO-3	Apply the Laplace transform for solving differential equations
CO-4	Find or compute the Fourier series of periodic signals
CO-5	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms
II-I Sem	**Course: :Mathematical Foundations Of Computer Science**
CO-I	Demonstrate skills in solving mathematical problems
CO-2	Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software

CO-3	Manipulate and analyze data numerically and/or graphically using appropriate Software
CO-4	Communicate effectively mathematical ideas/results verbally or in writing
CO-5	Comprehend mathematical principles and logic.
II-I Sem	**Course: :Introduction To Artificial Intelligence And Machine Learning**
CO-I	Enumerate the history and foundations of Artificial Intelligence
CO-2	Apply the basic principles of AI in problem solving
CO-3	Choose the appropriate representation of Knowledge
CO-4	Enumerate the Perspectives and Issues in Machine Learning
CO-5	Identify issues in Decision Tree Learning
II-I Sem	**Course: :Object Oriented Programming With Java**
CO-I	Able to realize the concept of Object Oriented Programming & Java Programming Constructs
CO-2	Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
CO-3	Apply the concept of exception handling and Input/ Output operations
CO-4	Able to design the applications of Java & Java applet
CO-5	Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit
II-I Sem	**Course: :Database Management Systems**
CO-I	Describe a relational database and object-oriented database
CO-2	Create, maintain and manipulate a relational database using SQL
CO-3	Describe ER model and normalization for database design
CO-4	Examine issues in data storage and query processing and can formulate appropriate solutions
CO-5	Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage
II-I Sem	**Course: :Introduction To Artificial Intelligence And Machine Learning Lab**
CO-I	Apply the basic principles of AI in problem solving using LISP/PROLOG
CO-2	Implement different algorithms using LISP/PROLOG

CO-3	Develop an Expert System using JESS/PROLOG
II-I Sem	**Course: :Object Oriented Programming With Java Lab**
CO-I	Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings
CO-2	Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
CO-3	Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
II-I Sem	**Course: :Database Management Systems Lab**
CO-I	Utilize SQL to execute queries for creating database and performing data manipulation operations
CO-2	Examine integrity constraints to build efficient databases
CO-3	Apply Queries using Advanced Concepts of SQL
II-I Sem	**Course: :Mobile App Development**
CO-I	Identify various concepts of mobile programming that make it unique from programming for other platforms
CO-2	Critique mobile applications on their design pros and cons
CO-3	Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces
CO-4	Program mobile applications for the Android operating system that use basic and advanced phone features and
CO-5	Deploy applications to the Android marketplace for distribution.
II-I Sem	**Course: :Essence Of Indian Traditional Knowledge**
CO-I	Understand the significance of Indian Traditional Knowledge
CO-2	Classify the Indian Traditional Knowledge
CO-3	Compare Modern Science with Indian Traditional Knowledge system
CO-4	Analyze the role of Government in protecting the Traditional Knowledge
CO-5	Understand the impact of Philosophical tradition on Indian Knowledge System.
II-II Sem	**Course: :Probability And Statistics**
CO-1	Classify the concepts of data science and its importance

CO-2	Interpret the association of characteristics and through correlation and regression tools
CO-3	Make use of the concepts of probability and their applications
CO-4	Apply discrete and continuous probability distributions
CO-5	Design the components of a classical hypothesis test
CO-6	Infer the statistical inferential methods based on small and large sampling tests
II-II Sem	**Course: Computer Organization**
CO-1	Develop a detailed understanding of computer systems
CO-2	Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
CO-3	Develop a detailed understanding of architecture and functionality of central processing unit
CO-4	Exemplify in a better way the I/O and memory organization
CO-5	Illustrate concepts of parallel processing, pipelining and inter processor communication
II-II Sem	**Course: Data Warehousing And Mining**
CO-1	Summarize the architecture of data warehouse
CO-2	Apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data.
CO-3	Construct a decision tree and resolve the problem of model overfitting
CO-4	Compare Apriori and FP-growth association rule mining algorithms for frequent itemset generation
CO-5	Apply suitable clustering algorithm for the given data set
II-II Sem	**Course: :Formal Languages And Automata Theory**
CO-1	Classify machines by their power to recognize languages.
CO-2	Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy
CO-3	Employ finite state machines to solve problems in computing
CO-4	Illustrate deterministic and non-deterministic machines
CO-5	Quote the hierarchy of problems arising in the computer science
II-II Sem	**Course: :Managerial Economics And Financial Accountancy**

CO-1	The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product.
CO-2	The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of input
CO-3	The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units
CO-4	The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.
CO-5	The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.
II-II Sem	**Course: :R Programming Lab (CS)**
CO-1	Implement basic concepts of R programming, and its different module that includes conditional, looping, lists, Strings, Functions, Frames, Arrays, and File programming.
CO-2	Implement the concepts of R Script to extract the data from data frames and file operations.
CO-3	Implement the various statistical techniques using R
II-II Sem	**Course: :Data Mining Using Python Lab (CS)**
CO-1	Apply preprocessing techniques on real world datasets
CO-2	Apply apriori algorithm to generate frequent itemsets.
CO-3	Apply Classification and clustering algorithms on different datasets.
II-II Sem	**Course: :Web Application Development Lab**
CO-1	Develop single page applications
CO-2	Develop nodejs & reactjs Reusable Service
CO-3	Store the data in mysql
II-II Sem	**Course: :Natural Language Processing With Python**
CO-1	Explore natural language processing (NLP) libraries in Python
CO-2	Learn various techniques for implementing NLP including parsing & text processing
CO-3	Understand how to use NLP for text feature engineering
III-I Sem	**Course: :Compiler Design**

CO-1	Demonstrate phases in the design of compiler
CO-2	Organize Syntax Analysis, Top Down and LL(1) grammars
CO-3	Design Bottom Up Parsing and Construction of LR parsers
CO-4	Analyze synthesized, inherited attributes and syntax directed translation schemes
CO-5	Determine algorithms to generate code for a target machine
III-I Sem	**Course: :Operating Systems**
CO-1	Describe various generations of Operating System and functions of Operating Syste
CO-2	Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
CO-3	Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
CO-4	Outline File Systems in Operating System like UNIX/Linux and Windows
CO-5	Solve Inter Process Communication problems using Mathematical Equations by various methods
III-I Sem	**Course: :Machine Learning**
CO-1	Explain the fundamental usage of the concept Machine Learning system
CO-2	Demonstrate on various regression Technique
CO-3	Analyze the Ensemble Learning Methods
CO-4	Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
CO-5	Discuss the Neural Network Models and Fundamentals concepts of Deep Learning
III-I Sem	**Course: :Optimization In Operations Research**
CO-1	State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.
CO-2	Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.
CO-3	Apply and Solve transportation and assignment problem by using Linear programming Simplex method.
CO-4	Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions
CO-5	Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. To reach a final optimal solution from the current optimal solution.

III-I Sem	Course: :Computer Vision
CO-1	Identify basic concepts, terminology, theories, models and methods in the field of computer vision,
CO-2	Describe basic methods of computer vision related to image stitching, photography like high dynamic range imaging and blur removal.
CO-3	Suggest a design of a computer vision system for a 3D Reconstruction, Albedos, image based rendering views and depths.
III-I Sem	**Course: :Data Visualization**
CO-1	Understand basics of Data Visualization
CO-2	Implement visualization of distributions
CO-3	Write programs on visualization of time series, proportions & associations
CO-4	Apply visualization on Trends and uncertainty
CO-5	Explain principles of proportions
III-I Sem	**Course: :DevOps**
CO-1	Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility.
CO-2	Describe devops &devsecops methodologies and their key concepts
CO-3	Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
CO-4	Set up complete private infrastructure using version control systems and CI/CD tools
CO-5	Acquire the knowledge of maturity model, Maturity Assessment
III-I Sem	**Course: :Operating Systems & Compiler Design Lab**
CO-1	Implement various scheduling, page replacement algorithms and algorithms related to deadlocks
CO-2	Design programs for shared memory management and semaphores
CO-3	Determine predictive parsing table for a CFG
III-I Sem	**Course: :Machine Learning Lab**
CO-1	Implement procedures for the machine learning algorithms
CO-2	Design and Develop Python programs for various Learning algorithms
CO-3	Apply appropriate data sets to the Machine Learning algorithms

III-I Sem	**Course: :Continuous Integration And Continuous Delivery Using Devops**
CO-1	Understand the why, what and how of devops adoption
CO-2	Attain literacy on Devops
CO-3	Align capabilities required in the team
III-I Sem	**Course: :Employability Skills-I**
CO-1	Understand the corporate etiquette.
CO-2	Make presentations effectively with appropriate body language
CO-3	Be composed with positive attitude
CO-4	Understand the core competencies to succeed in professional and personal life
III-I Sem	**Course: :Machine Learning (Minor)**
CO-1	Implement procedures for the machine learning algorithms
CO-2	Design and Develop Python programs for various Learning algorithms
CO-3	Apply appropriate data sets to the Machine Learning algorithms
CO-4	Develop Machine Learning algorithms to solve real world problems
III-II Sem	**Course: :Computer Networks**
CO-1	Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards.
CO-2	Discuss different transmission media and different switching networks
CO-3	Analyze data link layer services, functions and protocols like HDLC and PPP.
CO-4	Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
CO-5	Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.
III-II Sem	**Course: :Deep Learning**
CO-1	Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning
CO-2	Discuss the Neural Network training, various random models.

CO-3	Explain the Techniques of Keras, tensorflow, Theano and CNTK
CO-4	Classify the Concepts of CNN and RNN
CO-5	Implement Interactive Applications of Deep Learning.
III-II Sem	**Course: :Design And Analysis Of Algorithms**
CO-1	Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
CO-2	List and describe various algorithmic approaches and Solve problems using divide and conquer &greedy Method
CO-3	Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations.
CO-4	Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches
CO-5	Demonstrate NP Completeness theory ,lower bound theory and String Matching
III-II Sem	**Course: :Software Project Management**
CO-1	Apply the process to be followed in the software development life-cycle models
CO-2	Apply the concepts of project management & planning
CO-3	Implement the project plans through managing people, communications and change
CO-4	Conduct activities necessary to successfully complete and close the Software projects
CO-5	Implement communication, modeling, and construction & deployment practices in software development
III-II Sem	**Course: :Distributed Systems (PE)**
CO-1	Elucidate the foundations and issues of distributed systems
CO-2	Illustrate the various synchronization issues and globalstate for distributed systems
CO-3	Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems
CO-4	Describe the agreement protocols and fault tolerance mechanisms in distributed systems
CO-5	Describe the features of peer-to-peer and distributed shared memory systems
III-II Sem	**Course: :Internet Of Things (PE)**
CO-1	Review Internet of Things (iot).
CO-2	Demonstrate various business models relevant to iot

CO-3	Construct designs for web connectivity
CO-4	Organize sources of data acquisition related to iot, integrate to enterprise systems.
CO-5	Describe iot with Cloud technologies.
III-II Sem	**Course: :Network Programming (PE)**
CO-1	Identifying different models and sockets
CO-2	Demonstrate different TCP Echo server functions and I/O models
CO-3	Rationalize IPV4 and IPV6 Socket options
CO-4	Identifying daemon processing and Advanced input and output functions
CO-5	Analyze Broadcasting and multicasting
III-II Sem	**Course: :Mean Stack Development (JO)**
CO-1	Build static web pages using HTML 5 elements.
CO-2	Apply javascript to embed programming interface for web pages and also to perform Client side validations.
CO-3	Build a basic web server using Node.js, work with Node Package Manager (NPM) and recognize the need for Express.js.
CO-4	Develop javascript applications using typescript and work with document database using mongodb.
CO-5	Utilize Angular JS to design dynamic and responsive web pages.
III-II Sem	**Course: :Computer Networks Lab (PC)**
CO-1	Know how reliable data communication is achieved through data link layer.
CO-2	Suggest appropriate routing algorithm for the network.
CO-3	Provide internet connection to the system and its installation.
III-II Sem	**Course: :Algorithms For Efficient Coding Lab (PC)**
CO-1	Analyze the program execution time
CO-2	Analyze and calculate time complexity and space complexity of various algorithms
CO-3	Break down and describe the simulation of various algorithms for different input values.
III-II Sem	**Course: :Deep Learning With Tensorflow (PC)**

CO-1	Implement deep neural networks to solve real world problems
CO-2	Choose appropriate pre-trained model to solve real time problem
CO-3	Interpret the results of two different deep learning models
III-II Sem	**Course: :Mean Stack Technologies-Module I- Html 5, Javascript, Node.Js, Express.Js, And Typescript (SO)**
CO-1	Develop professional web pages of an application using HTML elements like lists, navigations, tables, various form elements, embedded media which includes images, audio, video and CSS Styles.
CO-2	Utilize javascript for developing interactive HTML web pages and validate form data.
CO-3	Build a basic web server using Node.js and also working with Node Package Manager (NPM).
CO-4	Build a web server using Express.js
CO-5	Make use of Typescript to optimize javascript code by using the concept of strict type checking.
III-II Sem	**Course: :Big Data : Apache Spark (SO)**
CO-1	Develop mapreduce Programs to analyze large dataset Using Hadoop and Spark
CO-2	Write Hive queries to analyze large dataset Outline the Spark Ecosystem and its components
CO-3	Perform the filter, count, distinct, map, flatmap RDD Operations in Spark.
CO-4	Build Queries using Spark SQL
CO-5	Apply Spark joins on Sample Data Sets
III-II Sem	**Course: :Employability Skills-II (MC)**
CO-1	Solve various Basic Mathematics problems by following different methods
CO-2	Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems
CO-3	Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.
CO-4	Analyze, summarize and present information in quantitative forms including table, graphs and formulas
III-II Sem	**Course: :Deep Learning (Minor)**
CO-1	Implement deep neural networks to solve real world problems
CO-2	Choose appropriate pre-trained model to solve real time problem

CO-3	Interpret the results of two different deep learning models
IV-I Sem	**Course: :Reinforcement Learning**
CO-1	Understand basic concepts of reinforcement learning identifying appropriate learning tasks for reinforcement learning techniques
CO-2	identifying appropriate learning tasks for reinforcement learning
CO-3	Understand various methods and applications of reinforcement learning
IV-I Sem	**Course: Soft Computing**
CO-1	Able to apply fuzzy logic and reasoning to handle uncertainty in engineering problems Make use of genetic algorithms to combinatorial optimization problems
CO-2	Apply artificial intelligence techniques, including search heuristics, knowledge representation, planning and reasoning
CO-3	Learn and apply the principles of self adopting and self organizing neuro fuzzy inference systems
CO-4	Evaluate and compare solutions by various soft computing approaches for a given problem
IV-I Sem	**Course: Cryptography And Network Security**
CO-1	Explain different security threats and countermeasures and foundation course of cryptography mathematics.
CO-2	Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography
CO-3	Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more
CO-4	Design applications of hash algorithms, digital signatures and key management techniques
CO-5	Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL,TSL, and IPsec .
IV-I Sem	**Course: Block Chain Technologies**
CO-1	Demonstrate the block chain basics, Crypto currency
CO-2	To compare and contrast the use of different private vs. Public block chain and use cases
CO-3	Design an innovative Bit coin Block chain and scripts, Block chain Science on varies coins
CO-4	Classify Permission Block chain and use cases – Hyper ledger, Corda
CO-5	Make Use of Block-chain in E-Governance, Land Registration, Medical Information Systems and others

IV-I Sem	**Course: Speech Processing**
CO-1	Understand the speech production and perception process.
CO-2	Analyze speech signals in time and frequency domain.
CO-3	Design and implement algorithms for processing speech signal
IV-I Sem	**Course: Robotic Process Automation**
CO-1	Describe RPA, where it can be applied and how it's implemented.
CO-2	Describe the different types of variables, Control Flow and data manipulation techniques.
CO-3	Identify and understand Image, Text and Data Tables Automation.
CO-4	Describe how to handle the User Events and various types of Exceptions and strategies
CO-5	Understand the Deployment of the Robot and to maintain the connection.
IV-I Sem	**Course: Cloud Computing**
CO-1	Illustrate the key dimensions of the challenge of Cloud Computing
CO-2	Classify the Levels of Virtualization and mechanism of tools
CO-3	Analyze Cloud infrastructure including Google Cloud and Amazon Cloud.
CO-4	Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud
CO-5	Assess control storage systems and cloud security, the risks involved its impact and develop cloud application
IV-I Sem	**Course: Big Data Analytics**
CO-1	Illustrate big data challenges in different domains including social media, transportation, finance and medicine
CO-2	Use various techniques for mining data stream
CO-3	Design and develop Hadoop
CO-4	Identify the characteristics of datasets and compare the trivial data and big data forvarious applications
CO-5	Identify the characteristics of datasets and compare the trivial data and big data forvarious applications
IV-I Sem	**Course: Nosql Databases**

CO-1	Discuss about Aggregate Data Models
CO-2	Explain about Master-Slave Replication, Peer-to-Peer Replication
CO-3	Describe the Structure of Data, Scaling, Suitable Use Cases
CO-4	Make use of Complex Transactions Spanning Different Operation
CO-5	Identify Routing, Dispatch and Location-Based Services
IV-I Sem	**Course: Video Analytics**
CO-1	Design video analytic algorithms for security applications
CO-2	Design video analytic algorithms for business intelligence
CO-3	Design custom made video analytics system for the given target application
IV-I Sem	**Course: Social Network Analysis**
CO-1	Know basic notation and terminology used in network science
CO-2	Be able to visualize, summarize and compare networks
CO-3	Illustrate basic principles behind network analysis algorithms
CO-4	Develop practical skills of network analysis in R programming language
CO-5	Be capable of analyzing real work networks
IV-I Sem	**Course: Recommender Systems**
CO-1	Understand the basic concepts of recommender systems
CO-2	Carry out performance evaluation of recommender systems based on various metrics
CO-3	Implement machine-learning and data-mining algorithms in recommender systems data sets.
CO-4	Design and implement a simple recommender system.
IV-I Sem	**Course: AI Chatbots**
CO-1	Develop an in-depth understanding of conversation design, including onboarding, flows, utterances, entities, and personality
CO-2	Design, build, test, and iterate a fully-functional, interactive chatbot using a commercial platform
CO-3	Deploy the finished chatbot for public use and interaction.

IV-I Sem	Course: Object Oriented Analysis And Design
CO-1	Analyze the nature of complex system and its solutions.
CO-2	Illustrate & relate the conceptual model of the UML, identify & design the classes and relationships
CO-3	Analyze &Design Class and Object Diagrams that represent Static Aspects of a Software System and apply basic and Advanced Structural Modeling Concepts for designing real time applications
CO-4	Analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams
CO-5	Analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems.

IV-I Sem	Course: Semantic Web
CO-1	Demonstrate social network analysis and measures.
CO-2	Analyze random graph models and navigate social networks data
CO-3	Apply the network topology and Visualization tools.
CO-4	Analyze the experiment with small world models and clustering models.
CO-5	Compare the application driven virtual communities from social network Structure

IV-I Sem	Course: API And Microservices
CO-1	Develop a Spring Data JPA application with Spring Boot
CO-2	Implement CRUD operations using Spring Data JPA
CO-3	Implement pagination and sorting mechanism using Spring Data JPA
CO-4	Implement query methods for querying the database using Spring Data JPA
CO-5	Implement a custom repository to customize a querying mechanism using Spring Data JPA

IV-I Sem	Course: Secure Coding Techniques
CO-1	Differentiate the objectives of information security
CO-2	Understand the trend, reasons and impact of the recent Cyber attacks
CO-3	Understand OWASP design principles while designing a web application
CO-4	Understand Threat modelling
CO-5	Importance of security in all phases of SDLC

IV-I Sem	Course: Machine Learning With GO
CO-1	Build a component-based application using Angular components and enhance their functionality using directives.
CO-2	Utilize data binding for developing Angular forms and bind them with model data.
CO-3	Apply Angular built-in or custom pipes to format the rendered data.
CO-4	Develop a single page application by using synchronous or asynchronous Angular routing.
CO-5	Make use of mongodb queries to perform CRUD operations on document database.
IV-I Sem	**Course: Reinforcement Learning**
CO-1	Understand basic concepts of Reinforcement learning
CO-2	Identifying appropriate learning tasks for Reinforcement learning techniques
CO-3	Understand various methods and applications of reinforcement learning
IV Sem -II	**PROJECT**
CO-1	Formulate., and apply mathematical, science and engineering principles to solve real time engineering problems
CO-2	Test the existing data, communicate and conduct research on complex problems using modern tools
CO-3	Validate the obtained results on contemprory issues related to society and environment
CO-4	Determine effectively the engineering principles used intheir project individually and as a team as per the norms of engineering practice
CO-5	Structure future work to promote life long learning in the context of technological adaptation.

Principal
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