ADITYA COLLEGE OF ENGINEERING

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Department of Artificial Intelligence and Machine Learning

Course Outcomes

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Class: I Year I Semester

Course Name with code		Course Outcome
Communicative English (C111)	CO1	Understand past culture, tradition, speaking English in real life situations
	CO2	Infer and interpret the admonitions of a father to his daughter answering a series of questions, greetings and leave takings
	CO3	Apply mechanics of writing in writing letters on various contexts,cover letters, CVs, E-mail etiquette, academic proposals, research articles and biographies.
	CO4	Understanding societal problems and finding the suitable solution with reference to Wangari Maathai
	CO5	Compare and contrast racial discrimination, better listening for better speaking and using right vocabulary
	CO6	Understand the importance of soft skills, effective communication skills, usage of functional grammar in communication.
Mathematics -I (C112)	CO1	Discuss the Ratio test and Mean value theorems
	CO2	Solve First order Linear differential equations
	CO3	Solve the Higher order non-homogeneous Differential Equations
	CO4	Model physical phenomena of LCR series circuit and Simple Harmonic Motion
	CO5	Determine the extreme values for the function of two variables.
	CO6	Compute double and triple integrals to find Area and Volume.
Applied Chemistry (C113)	CO1	Explain about fabrication of plastic and recycling of e waste.
	CO2	Explain types of batteries and control methods of corrosion.
	CO3	Determine the preparation of Non elemental semiconducting materials
	CO4	Determine the synthesis of nano materials and its applications.
	CO5	Analyse spectroscopic instrumentations and compare sources of energy
	CO6	Discuss molecular machines and molecular motors

Programming for Problem Solving using C (C114)	CO1	To discuss machine language with the help of numbering system and recognize different variables different statements and different storages to write a program
	CO2	To predict for which problem we have to use which type of decision statements and which type of loop
	CO3	To classify the data by storing data in different formats like arrays structures and unions
	CO4	To analyze diff application of pointers to access values of memory locations through address and variable
	CO5	To subdivide the problem into functions and retrieving file information using file operations
	CO6	To operate data in file information using file operations
Computer Engineering Workshop (C115)	CO1	Identify the peripherals of a computer
	CO2	Demonstrate Virtual machine setup and operating system installation fundamentals
	CO3	Discuss various Text Editors, Microsoft Word, Power Point,Microsoft Excel & LaTeX
	CO4	Identify 44 sounds of language and develop correct pronunciation learning Phonetics
English Communication Skills Laboratory (C116)	CO1	Identify 44 sounds of language and develop correct pronunciation
	CO2	Demonstrate language functions: LSRW Skills
	CO3	Develop and practice correct accent, intonation, and rhythm to get acquaintance with language.
	CO4	Develop speaking skills through participation in activities and vocabulary
Applied Chemistry Lab (C117)	CO1	Explain volumetric analysis with different indicators
	CO2	Calculate the Hardness of water by EDTA
	CO3	Calculate the Alkalinity of water sample by HCl solution
	CO4	Analyse the quantity of ions in organic solutions
Programming for Problem Solving using C Lab(C118)	CO1	Knowledge on various concepts of C language
	CO2	Design and development of C program using loops
	CO3	Design and development of C problem solving skills using arrays
	CO4	Design and develop programs on functions
Environmental Science* (C119)	CO1	Understand the phenomenon of natural resources
	CO2	Understanding of the ecosystem and its diversity
	CO3	Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
	CO4	Understanding of the environmental impact of developmental activities
	CO5	Awareness on the social issues, environmental legislation and global treaties.
	CO6	Analyse Impact Assessment and its significance various stages

Class: I Year II Semester

Course Name with code		Course Outcome
Mathematics-II(C121)	CO1	Explain system of linear algebraic equations using Gauss Elimination method
	CO2	Use Cayley-Hamilton theorem to find the inverse and power of a matrix problems
	CO3	Solve the approximate roots of polynomial and transcendental equations by using Iterative methods
	CO4	Solve the system of linear equations using Gauss Jacobi and Gauss- Seidal methods
	CO5	Apply Newton's forward and backward interpolation forequal intervals and Lagrange's formula for unequal intervals
	CO6	Apply Numerical Integral techniques to different Engineering problems
Applied Physics (C122)	CO1	Understand the concepts of interference, diffraction and polarization: connect it to a few engineering applications
	CO2	Explain concepts of lasers and Optical fibers
	CO3	Explain the fundamental concepts of Quantum behavior of matter and electron theory.
	CO4	Describe basics of dielectrics and magnetism
	CO5	Comprehend the use of concepts of semiconductor physics. Explore a few of their technological applications
	CO6	Illustrate basics of Superconductivity and its applications.
Digital Logic Design (C123)	CO1	Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
	CO2	Understand the different switching algebra theorems and apply them for logic functions
	CO3	Define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
	CO4	Design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays.
	CO5	Design various sequential circuits starting from flip-flop to registers and counters.
	CO6	Understand Synchronous sequential Logic: Latches and Flip-Flops

Python Programming (C124)	CO1	Develop essential programming skills in computer programming concepts like data types, containers
	CO2	Apply the basics of programming in the Python language
	CO3	Solve coding tasks related conditional execution, loops
	CO4	Solve coding tasks related to the fundamental notions and techniques used in object- oriented programming
	CO5	Design the functionalities of Lists and dictionaries
	CO6	Analyze different File Operations
Data Structures (C125)	CO1	Develop essential programming skills in computer programming concepts like data types, containers
	CO2	Apply the basics of programming in the Python language
	CO3	Solve coding tasks related conditional execution, loops
	CO4	Solve coding tasks related to the fundamental notions and techniques used in object- oriented programming
	CO5	Design the functionalities of Lists and dictionaries
	CO6	Analyze different File Operations
Applied Physics Lab (C126)	CO1	Determine the various parameters like wavelength of different light sources, curvature of lens using spectrometer and travelling microscope
	CO2	Apply the concepts related to semiconductors, electric and magnetic fields
	CO3	Demonstrate the photo electric effect
	CO4	Apply theoretical principles for measurements in the laboratory
Python Programming Lab (C127)	CO1	Develop key programming abilities in data types, containers, and other computer programming topics.
	CO2	Utilize the fundamentals of programming with the Python programming language
	CO3	Solve code problems involving conditional execution and loops
	CO4	Find out how to do coding tasks that relate to the basic ideas and techniques used in object-oriented programming.
Data Structures Lab(C128)	CO1	Use basic data structures such as arrays and linked list.
	CO2	Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths
	CO3	Use various searching and sorting algorithms.
	CO4	Implement Queue using arrays and LinkedList
	CO5	Implement stack using arrays Linked list and Stack operations to evaluate postfix expression
	CO6	Create a BST for traversing in preorder, inorder and postorder

Class: II Year I Semester

Course Name with code		Course Outcome
Mathematics III(C211)	CO1	Compute Line, Surface, Volume integrals using Green's, Stoke's and Divergence theorems.
	CO2	Use Laplace Transform methods to solve initial value problems for constant coefficient linear ordinary differential equations.
	CO3	Discuss the expansion of a given periodic function by Fourier series in the given interval.
	CO4	Solve engineering problems using Fourier Transforms and Inverse Fourier Transforms.
	CO5	Apply a range of techniques to solve first and second order linear partial differential equations.
	CO6	Model physical phenomena of Heat and Wave equations by using Partial differential equations.
Mathematical Foundations of Computer Science(C212)	CO1	Discuss the validity of logical argument.
	CO2	Use logical notations to formulate and reason about fundamental concept such as sets, relations and functions.
	CO3	Explain the conceptpermutation, combination, binomial and multiple coefficients.
	CO4	Apply various properties of integers including the primes and unique factorization.
	CO5	Solve and formulate generating function and recurrence functions
	CO6	Identify various graphs, types of graphs and properties of graphs
Introduction to Artificial Intelligence and Machine Learning(C213)	CO1	Evaluate the history and foundations of Artificial Intelligence
	CO2	Apply the basic principles of AI in problem solving
	CO3	Choose the appropriate representation of Knowledge
	CO4	Evaluate the Perspectives and Issues in Machine Learning
	CO5	Identify issues in Decision Tree Learning
	CO6	Implement the Simulated Annealing Algorithm using LISP/PROLOG
Object Oriented Programming with Java(C214)	CO1	Describe data types, variables, operators,strings and simple programs
	CO2	Explain control statements and arrays
	CO3	Discuss classes, objects and methods
	CO4	Describe inheritance and interfaces
	CO5	Apply the concepts packages and Exception handling
	CO6	Solve problems using Multithreading and Java Database connectivity.
Database Management Systems(C215)	CO1	Illustrate the concept of Database Management System.
	CO2	Explain Entity Relationship Diagrams.
	CO3	Identify and apply the SQL, Relational Algebra and Relational Calculus queries.
	CO4	Construct a database with understanding on normal forms based on functional dependency.
	CO5	Explain the concept of Transaction Processing.
	CO6	Summarize the concepts related to Concurrency Control.

Introduction to Artificial Intelligence and Machine Learning Lab(C216)	CO1	Apply the basic principles of AI in problem solving using LISP/PROLOG
	CO2	Illustrate DFS,BFS,TSP using heuristic approach using Java/LISP/Prolog
	CO3	Implement different algorithms using LISP/PROLOG
	CO4	Develop an Expert System using JESS/PROLOG
	CO5	Analyze Hill-climbing to solve 8- Puzzle Problem
	CO6	Implement the Simulated Annealing Algorithm using LISP/PROLOG
Object Oriented Programming with Java Lab(C217)	CO1	Write Programs using operators and data types
	CO2	Write programs using control statements and arrays
	CO3	Design programs using classes, objects and methods
	CO4	Design programs using inheritance and interfaces
	CO5	Apply the concepts packages and Exception handling
	CO6	Design programs using Strings,Multithreading and Java Database connectivity.
Database Management Systems Lab(C218)	CO1	Write the queries for create , drop and alter the table in database system to apply constraints.
	CO2	Write the quaries using operations in SQL
	CO3	Write the Quaries using in functions of SQL
	CO4	Write the Quaries using in transaction control language commands.
	CO5	Design the programs of basic PL/SQL program
	CO6	Design the programs using loops,conditional statements in PL/SQL program
Mobile App Development(C219)	CO1	Illustrate the various concepts of mobile applications and Android applications
	CO2	Demonstrate the pros and cons of mobile application of their design
	CO3	Design and develop mobile interfaces by using prototyping techniques
	CO4	write the basic program of the mobile application for the Android operating system
	CO5	Develop the mobile applications for usage
	CO6	Make use of the Android applications that are developed and helpful for market place distribution
Essence of Indian Traditional Knowledge(C2110)	CO1	Outline the Indian traditional knowledge
	CO2	Analyze the traditional knowledge system
	CO3	Summarize the need of Indian traditional knowledge
	CO4	Choose the Recognition of forest rights, Biological diversity act and Geographical indications
	CO5	Explain the protection of Indian traditional knowledge
	CO6	Make use of traditional knowledge connects with agriculture, biotechnology and medicine system

Class: II Year II Semester

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Probability and Statistics(C221)	CO1	Define complex variation and function also State and Prove Cauchy integral theorem and
	CO2	Explain line integral and also use expand taylor's and Laurent series expression
	CO3	Explain the concept of probability and probability distributions. Also calculate mean and variance of different probability distributions.
	CO4	Differentiate the concept of sampling and non sampling procedures
	CO5	Predict Confidence interval estimation and determination of sample size
	CO6	Setup hypothesis and parameters are verified through the sample
Computer Organization(C222)	CO1	Demonstrate an understanding of the design of functional units in a digital computer system, including the ability to relate postulates of Boolean algebra to minimize combinational functions, as well as the capability to recognize, manipulate, and interpret representations of numbers stored in digital computers.
	CO2	Build the logic families and realize logic gates, while also demonstrating the ability to design and analyze both combinational and sequential circuits.
	CO3	Develop proficiency in computer arithmetic,knowledge in register transfer language and microinstructions and a strong foundation in basic computer organization and design.
	CO4	Develop a comprehensive understanding of design of control units and Explore the central processing unit (CPU).
	CO5	Gain knowledge in memory organization and Explore the input-output organization in micro level
	CO6	
Data Warehousing and Mining(C223)	CO1	Illustrate the importance of Data Warehousing, Data Mining and its functionalities and Design schema for real time data warehousing applications.
	CO2	Demonstrate on various Data Preprocessing Techniques viz. data cleaning, data integration, data transformation and data reduction and Process raw data to make it suitable for various data mining algorithms
	CO3	Choose appropriate classification technique to perform classification, model building and evaluation
	CO4	Make use of association rule mining techniques viz. Apriori and FP Growth algorithms and analyze on frequent itemsets generation.
	CO5	Identify and apply various clustering algorithm (with open source tools), interpret, evaluate and report the result
	CO6	Apply various clustering algorithm
Formal Languages and Automata Theory(C224)	CO1	Discuss properties of different grammar and languages
	CO2	Solve problems related to string membership to an automata and respective language
	CO3	Create grammar for specific language
	CO4	Identify language accepted by particular automata
	CO5	Design optimum automata for particular language
	CO6	Solve problems related to Turing Machines and Decidability

Managerial Economics and Financial Accountancy(C225)	CO1	Estimating the Demand and demand elasticities for a product
	CO2	understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs
	CO3	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
	CO4	to prepare Financial Statements and the usage of various Accounting tools for Analysis
	CO5	to evaluate various investment project proposals with the help of capital budgeting techniques for decision making
	CO6	Analyse Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments
R Programming Lab(C226)	CO1	Implement basic concepts of R programming, and its different module that includes conditional, looping, lists, Strings, Functions, Frames, Arrays, and File programming
	CO2	Implement the concepts of R Script to extract the data from data frames and file operations.
	CO3	Implement the various statistical techniques using R.
	CO4	Extend the functionality of R by using add-on packages 5
	CO5	Use R Graphics and Tables to visualize results of various statistical operations on data
	CO6	Read different types of data sets (.txt, .csv) from Web
Data Mining using Python Lab(C227)	CO1	Apply preprocessing techniques on real world datasets
	CO2	Apply apriori algorithm to generate frequent itemsets.
	CO3	Apply Classification and clustering algorithms on different datasets.
	CO4	Apply K- Means clustering algorithm on any dataset
	CO5	Apply Hierarchical Clustering algorithm on any dataset.
	CO6	Apply DBSCAN clustering algorithm on any dataset
Web Application Development Lab(C228)	CO1	Develop Single Page Applications
	CO2	To Examine the authentication using Java Servlet and JSP
	CO3	Examine and Connect MySQL database using JSP
	CO4	Develop NodeJS & ReactJS Reusable Service
	CO5	To Show the data in MySQL
	CO6	Evaluate latest web application development trends in the IT industry
Natural Language Processing with Python(C229)	CO1	Demonstrate natural language processing (NLP) libraries in Python
	CO2	Design algorithms for natural language processing tasks.
	CO3	Demonstrate how to use NLP for text feature engineering
	CO4	Explain extraction of meaningful information from a piece of text.
	CO5	List various NLP techniques to solve a particular NLP problem.
	CO6	Explain Lemmatization and Stemming using NLP Techniques

Class: III Year I Semester

Course Name with code		Course Outcome
Compiler Design(C311)	CO1	Demonstrate phases in the design of compiler
	CO2	Organize Syntax Analysis, Top Down and LL(1) grammars
	CO3	Determine Bottom Up Parsing and Construction of LR parsers
	CO4	Analyze synthesized, inherited attributes and syntax directed translation schemes
	CO5	Determine algorithms to generate code for a target machine
	CO6	Organize Run time Environments
Operating Systems(C312)	CO1	Understanding of operating system functions, structures, operations, and interfaces, as well as the ability to analyze and apply these concepts to various computing environments, including open-source operating systems.
	CO2	Apply their knowledge of process concepts, multithreaded programming, and inter-process communication to design and implement concurrent systems, effectively addressing synchronization and communication challenges in diverse computing environments.
	CO3	Demonstrate a comprehensive understanding of Memory Management Strategies
	CO4	Understanding of Virtual Memory Management
	CO5	Analyze and apply strategies for deadlocks, assess file systems, and evaluate secondary storage structures to optimize computing environments effectively.
	CO6	Analyze security principles and domain, apply access control measures, assess system and network threats, and evaluate security defenses, utilizing case studies of Linux and Microsoft Windows to reinforce understanding.
Machine Learning(C313)	CO1	Explain the fundamental usage of the concept Machine Learning system
	CO2	Show practical competence in applying supervised learning to real-world datasets, making informed decisions in machine learning solutions.
	CO3	Demonstrate on various regression Technique
	CO4	Analyze the Ensemble Learning Methods
	CO5	Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
	CO6	Discuss the Neural Network Models and Fundamentals concepts of Deep Learning

Optimization in Operations Research(C314)	CO1	State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.
	CO2	Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution
	CO3	Apply and Solve transportation and assignment problem by using Linear programming Simplex method.
	CO4	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
	CO5	Apply and Solve Non-linear Programming and convex programming problem
	CO6	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
Software EngineeringC315)	CO1	Ability to create an object oriented design.
	CO2	Compare conventional and agile software methods.
	CO3	Upon completion, students will excel in requirements analysis, modeling, and software development, including UML and web application-specific techniques
	CO4	Students will master requirements analysis, UML modeling, and web application-specific skills for software development
	CO5	Plan to transform an object oriented design into high quality, executable code.
	CO6	Ability to test the quality of a product
Operating Systems & Compiler Design Lab(C316)	CO1	Implement various scheduling, page replacement algorithms and algorithms related to deadlocks
	CO2	Design programs for shared memory management and semaphores
	CO3	Determine predictive parsing table for a CFG
	CO4	Demonstrate a deep understanding of Multiprogramming concepts, both with a fixed number of tasks (MFT) and a variable number of tasks (MVT)
	CO5	Apply Lex and Yacc tools
	CO6	Examine LR parser and generating SLR Parsing table
Machine Learning Lab(C317)	CO1	Understand the mathematical and statistical prospectives of machine learning algorithms through python programming.
	CO2	Design and evaluate the unsupervised models through python in built functions.
	CO3	Evaluate the machine learning models pre-processed through various feature engineering algorithms by python programming.
	CO4	Design and apply various reinforcement algorithms to solve real time complex problems.
	CO5	Design and develop the code for recommender system using Natural Language processing
	CO6	Understand the basic concepts of deep neural network model and design the same.

Continuous Integration and Continuous Delivery using DevOps(C318)	CO1	Identify components of Devops environment.
	CO2	Describe Software development models and architecturesof DevOps.
	CO3	Apply different project management, integration, testingand code deployment tool.
	CO4	Investigate different DevOps Software development models.
	CO5	Assess various Devops practices
	CO6	Collaborate and adopt Devops in real-time projects

Class: III Year II Semester

Course Name with code		Course Outcome
Computer Networks(C321)	CO1	Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission
	CO2	Apply channel allocation, framing, error and flow control techniques.
	CO3	Describe the functions of Network Layer i.e. Logical addressing, subnetting & Routing Mechanism
	CO4	Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism
	CO5	Explain the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN.
	CO6	Determine application layers services and client server protocols working with client server paradigm
Deep Learning(C322)	CO1	Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning
	CO2	Discuss the Neural Network training, various random models.
	CO3	Explain the Techniques of Keras, TensorFlow, Theano and CNTK
	CO4	Classify the Concepts of CNN and RNN
	CO5	Develop Interactive Applications of Deep Learning
	CO6	Able to design and deploy simple TensorFlow-based deep learning solutions to classification problems
Design and Analysis of Algorithms(C323)	CO1	Demonstarte asymptotic notation used for denoting performance of algorithms
	CO2	Analyse the performance of a given algorithm and denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
	CO3	List and describe various algorithmic approaches
	CO4	Solve problems using divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches
	CO5	Apply graph search algorithms to real world problems
	CO6	Demonstrate an understanding of NP- Completeness theory and lower bound theory

Software Project Management(C324)	CO1	Apply the process to be followed in the software development lifecycle models
	CO2	Apply the concepts of project management and planning
	CO3	Understanding to manage software architectures from both a management and technical perspective
	CO4	Understanding in iterative software development processes.
	CO5	Inspect activities necessary to successfully complete and close the software projects
	CO6	Implement communication, modelling and construction & deployment practices in software development
Computer Networks Lab (C325)	CO1	Know how reliable data communication is achieved through data link layer.
	CO2	Show appropriate routing algorithm for the network.
	CO3	Perceive internet connection to the system and its installation.
	CO4	Utilise various network management tools
	CO5	show Network devices in detail and connect the computers in Local Area Network
	CO6	Work on various network management tools
MEAN Stack Development(C326)	CO1	Construct webpages with basic designing using HTML5
	CO2	Apply Java script technology to build interaction between client and server
	CO3	Build a basic web server using Node.js, work with node package Manager(NPM)and recognize the need for Express.js
	CO4	Demonstrate the Connection of MangoDB with Mongoose by using Express.js
	CO5	Develop connection between Java script applications and data base with the help of mongodb
	CO6	Utilize angular js for converting static web pages into dynamic webpages
MEAN Stack Technologies - Module I(C327)	CO1	Develop static web pages using basic HTML tags like lists,forms,tables,images,audio, video and CSS styles
	CO2	Utilize Java script for making responsive webpages with data validation
	CO3	Build a basic web server using Node.js and also working with Node package manager(NPM)
	CO4	Build a web server using Express.js
	CO5	Develop API Using Express.js
	CO6	Make strict usage of typescript for optimizing java script code

Algorithms for efficient coding lab(C328)	CO1	Analyze the program execution time
	CO2	Develop a program and measure the running time for Quick Sort with Divide and Conquer
	CO3	compare optimal Binary search trees with Dynamic Programming
	CO4	Develop the running time for Graph Coloring with Backtracking
	CO5	Define running time to generate solution of Knapsack problem with Backtracking
	CO6	Measure running time to generate solution of Knapsack problem with Backtracking
Deep Learning with Tensorflow(C329)	CO1	Implement deep neural networks to solve real world problems
	CO2	Design a neural network for classifying Movie reviews,news wires ,houses prices
	CO3	Choose appropriate pre-trained model to solve real time problem
	CO4	Build a Convolution Neural Network for Hand written Digit Classification.,simple image Classification
	CO5	Interpret the results of two different deep learning models
	CO6	Build natural language processing systems using TensorFlow.