Vidyavardhini's college of Engineering & Technology Vasai(w)
Department of Computer Science and Engineering(Data Science)
Course Outcomes for R-2019 Syllabus

Program Outcomes
PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9. Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12. Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes	
	At the end of the semester student will able to
FEC101	**Applied Mathematics I**
FEC101.1	Apply the concepts of Complex Numbers,to solve Engineering problems.
FEC101.2	Apply hyperbolic functions and logarithm of complex number to solve Engineering problems.
FEC101.3	Apply Compute the partial differentiation of functions of two & three variables.
FEC101.4	Apply find the nth order derivative of a function using successive differentiation & Compute maxima-minima of a function.
FEC101.5	Apply the properties of matrices to find rank of a matrix & to solve system of linear simultaneous equations.
FEC101.6	Apply the concept of Numerical Methods to solve system of linear algebraic equations, transcendental equation.
FEC102	**Applied Physics I**
FEC102.1	Know the fundamentals of quantum mechanics and its applications.
FEC102.2	Draw miller indices using concept of crystallography and Identify crystal structure using X-ray diffraction techniques viz. Bragg's diffractometer
FEC102.3	Apply concepts of semiconductor physics to understand principle and working of LED, photoconductor and photovoltaic cell.
FEC102.4	Use concept of interference in thin films in measurements.
FEC102.5	Discuss properties of superconductors and super capacitor.
FEC102.6	Know the principles of engineering materials.
FEC103	**Applied Chemistry I**
FEC103.1	Analyze the quality of water and suggest methods of treatment.
FEC103.2	Differentiate thermosoftening & thermosetting plastic & select appropriate fabrication method.
FEC103.3	Understand the concept of microscopic chemistry in terms of atomic and molecular orbital theory & calculate bond order of molecule.
FEC103.4	Understand the concept of aromaticity & calculate aromaticity using Huckel's Rule.
FEC103.5	Understand Gibb's phase rule & calculate number of phases, component & degree of freedom of one & two component system.
FEC103.6	Differentiate ionic, dipolar & Vander waal's intermolecular forces of attraction.
FEC104	**Engineering Mechanics**
FEC104.1	Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two and three dimensional systems with the help of FBD.
FEC104.2	Demonstrate the understanding of Centroid and its significance and locate the same
FEC104.3	Estimate required force to overcome friction and correlate real life application to specific type of friction.
FEC104.4	Establish relation between velocity and acceleration of a particle and analyse the motion by plotting the relation.
FEC104.5	Illustrate different types of motions and establish Kinematic relations for a rigid body.
FEC104.6	Analyse body in motion using force and acceleration, work-energy, impulse- momentum principles

FEC105	**Basic Electrical Engineering**
FEC105.1	Analyze DC cicuits and apply Superposition, Thevenin's Nortons, Maximum power transfer theorems to determine therir response.
FEC105.2	Analyse 1-Φ AC circuitsand determine their response.
FEC105.3	Analyse 3-Φ circuits and detrmine voltage-current relationship in star and delta connection.
FEC105.4	Perform oc/sc test on 1-Φ Transformerand evaluate /determine its equivalent circuit and efficiency.
FEC105.5	Undersatnd the working principle , constructional details and operation of 1-Φ & 3-Φ Machines.
FEL101	**Engineering Physics-I Lab**
FEL101.1	Draw miller indices for a given unit cell.
FEL101.2	Calculate energy band gap of semiconductor for a given semiconductor material.
FEL101.3	Calculate Hall coefficient of material and carrier concentration of a given material.
FEL101.4	Calculate radius of curvature of a lens using Newton's ring set up.
FEL101.5	Calculate thickness of paper using Wedge shape film.
FEL102	**Engineering Chemistry-I Lab**
FEL102.1	Analyze water for its hardness.
FEL102.2	Estimate viscosity of lubricant using Redwood viscometer.
FEL102.3	Estimate chloride content of water using Mohr's method.
FEL102.4	Estimate PH of different solutions using PH meter.
FEL102.5	Demonstrate phenol-formaldehyde synthesis.
FEL103	**Engineering Mechanics Lab**
FEL103.1	Verify the law of polygon, varignon's theorem and find the resultant of given force system
FEL103.2	Verify the conditions of equilibrium and find the beam reactions
FEL103.3	Analyse the friction between two different surfaces.
FEL103.4	Demonstrate the understanding of Centroid and its significance and locate the same
FEL103.5	Illustrate different types of motions and establish Kinematic relations for particles and rigid body.
FEL103.6	Verify the law of conservation of momentum and find the coefficient of restitution.
FEL104	**Basic Electrical Engineering**
FEL104.1	Implement DC circuits and analyze their behavior using network theorem
FEL104.2	Implement RLC circuit and calculate resonance frequency , Bandwidth and Q- factor
FEL104.3	Determine relationship between line/ phase voltage/ current in three phase star / delta circuit
FEL104.4	Perform OC/SC test on transformer and determine its equivalent circuit and efficiency
FEL104.5	Identify the components of a D.C. Machine
FEL105	**Basic Workshop Practice I**
FEL105.1	Model different prototypes in the carpentry trade such as Cross cut lap joint, Tee lap joint, Dovetel lap joint.
FEL105.2	Model various basic prototypes in the trade of fitting such as Square, Hexagonal and V Male Female joint.
FEL105.3	Perform various basic House Wiring techniques while taking care of electrical safety.
FEL105.4	Perform various basic domestic plumbing operations such as pipe cutting, threading, fitting etc.
FEC201	**Applied Mathematics II**
FEC201.1	Solve differential equations of first order & first degree.
FEC201.2	Solve linear differential equations with constant coefficients, variable coefficients of higher order.
FEC201.3	Apply Beta, Gamma functions and D.U.I.S.to solve improper integrals.
FEC201.4	Apply concepts of Double integral of different coordinate systems to compute Area & Mass.
FEC201.5	Apply concepts of triple integral of different coordinate systems to find volume of a solids.
FEC201.6	Solve Differential equations & Definite integrals using Numerical Methods.
FEC202	**Applied Physics II**
FEC202.1	Calculate wavelength of light using diffraction grating and resolving power of grating.
FEC202.2	Apply the principles of Laser and fibre optics in modern communication technology.
FEC202.3	Relate the fundamentals of electrodynamics for satellite communication, antenna theory.
FEC202.4	Know the fundamentals of relativity.
FEC202.5	Select Tools for characterisation of nanomaterials and method to synthesize nanomaterial
FEC202.6	Classify sensors based on their sensing technique.
FEC203	**Applied Chemistry II**
FEC203.1	Identify types of corrosion & discuss corrosion control measures.
FEC203.2	Analyze the quality of fuel & calculate the oxygen required for combustion of fuel.
FEC203.3	Discuss the range of EMS used for molecular transitions in spectroscopic techniques.
FEC203.4	Discuss the phenomenon of fluorescence & Phosphorescence.
FEC203.5	Understand the concept of electrode potential & calculate EMF of cell.
FEC203.6	Understand the principles of green chemistry&
FEC204	**Engineering Graphics**
FEC204.1	Apply the basic principles of projections in Projection of Lines, Planes and Engineering Curves
FEC204.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEC204.3	Visualize the given 3D object and draw Orthographic projections
FEC204.4	Draw Isometric view from the given orthographic projections
FEC204.5	Draw Orthographic and Isometric Projection using AutoCad

FEC205	**C programming**
FEC205.1	Identify the terminologies in operating system used for computer programming and illustrate the algorithms to support Structure
FEC205.2	Use Variables, derived data types and control structures to write C program.
FEC205.3	Implement solutions to the problem using strings and functions.
FEC205.4	Decompose a problem into functions and synthesize a complete program.
FEC205.5	Structure-Union and Files for solving complex Computational problem.
FEC205.6	Use Pointers for solving complex Computational problem.
FEC206	**Professional Communication and Ethics- I**
FEC206.1	Communicate effectively using verbal/non-verbal cues at social and workplace situation.
FEC206.2	Select/Use appropriate grammar and vocabulary in oral, written communication
FEC206.3	Summarize/Comprehend passages, run plagiarism check softwares and generate plagiarism report for paraphrased passages.
FEC206.4	Write/ Draft academic, business and technical letter/email.
FEC206.5	Frame Definition, write user instruction, description of technical object, description of a Technical / Scientific Process
FEC206.6	Demonstrate principles of ethics in professional environment
FEL201	**Engineering Physics-II Lab**
FEL201.1	Calculate wavelength of given colour using diffraction grating
FEL201.2	Calculate number of lines on the grating using Laser source
FEL201.3	Calculate numerical aperture of an optical fibre
FEL201.4	Determine I-V characteristics of photodiode
FEL201.5	Calculate volume of room using ultrasonic distance meter.
FEL202	**Engineering Chemistry-II**
FEL202.1	Analyse fuel for moisture content.
FEL202.2	Estimate Na,k & Ca in the given sample using flame photometer.
FEL202.3	Estimate flash point of diesel oil using Abel's apparatus.
FEL202.4	Estimate saponification value of vegetable oil.
FEL202.5	Estimate acid value of vegetable oil.
FEL203	**Engineering Graphics Lab**
FEL203.1	Apply the basic principles of projections in Projection of Lines and Planes and Curves
FEL203.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEL203.3	Apply basic AutoCAD skills to draw different views of a 3D object
FEL203.4	Apply basic AutoCAD skills to draw the isometric view from the given two views
FEL204	**C programming Lab**
FEL204.1	Translate given algorithms to a program
FEL204.2	Use variables, derived data types and control structures to write c program
FEL204.3	Write iterative as well as recursive programs
FEL204.4	Represent data in Array and String and manipulate them through a program
FEL204.5	Use Structure-Union for solving complex computational problem
FEL204.6	Declare pointers and demonstrate call by reference concept
FEL205	**Professional Communication and Ethics- I Lab**
FEL205.1	Listen and comprehend all types of spoken discourse successfully
FEL205.2	Speak fluently and make effective professional presentations.
FEL205.3	Read large quantities of text in a short time to comprehend, summarise and evaluate content
FEL205.4	Draft precise business letters, academic essays and technical guidelines.
FEL205.5	Dress finely and conduct themselves with confidence in social, academic and professional situation.
FEL205.6	Respond to moral dilemmas successfully
FEL201	**Basic Workshop Practice II**
FEL201.1	Model different prototypes in the carpentry trade such as Cross cut lap joint, Tee lap joint, Dovetel lap joint.
FEL201.2	Model various basic prototypes in the trade of fitting such as Square, Hexagonal and V Male Female joint.
FEL201.3	Read various basic Layout drawing; make positive and negative film, and perform PCB etching and drilling, Tinning and soldering operations.
FEL201.4	Dismantle and Assemble a Personal Computer, perform Basic troubleshooting and maintenance, identify network components and perform Basic networking
CSC301	**Engineering Mathematics-III**
CSC301.1	Apply the concept of Laplace transform and its application to solve the real integrals in engineering problems.
CSC301.2	Apply the concept of inverse Laplace transform of various functions and its application in engineering problems.
CSC301.3	Expand the periodic function by using the Fourier series for real life problems and complex engineering problems.
CSC301.4	Apply complex variable theory, application of harmonic conjugate to get orthogonal trajectories and analytic functions.
CSC301.5	Apply the concept of correlation and Regression to the engineering problems.
CSC301.6	Apply the concept of probability and expectation for getting the spread of the data and distribution of probabilities.
CSC302	**Discrete Structures and Graph Theory**
CSC302.1	Apply the concept of mathematical thinking and mathematical proofs in problem solving.
CSC302.2	Apply the concept of relations and functions to reason logically.
CSC302.3	Apply the concept of Posets and Lattice.

CSC302.4	Apply basic counting principles and recurrence in problem solving.
CSC302.5	Apply Coding theory in problems solving with understanding of Algebraic Structure
CSC302.6	Apply concepts of graph theory in solving problems.
CSC303	**Data Structure**
CSC303.1	Understand the concepts of Linear and Non-Linear Data Structures
CSC303.2	Apply insertion, deletion and traversal operations on stacks and queue data structures
CSC303.3	Apply insertion and deletion operations on different types of Linked Lists
CSC303.4	Apply insertion, deletion and searching operations on Binary Search tree, AVL tree, and introduction to B Tree, B+ Tree, Huffman Encoding
CSC303.5	Use Graph Traversal algorithms to determine shortest path and connectivity between nodes
CSC303.6	Apply appropriate searching technique, hashing function and collision resolution techniques for a data sequence
CSC304	**Digital Logic & Computer Organization and Architecture**
CSC304.1	Convert one number system to another and realize logic circuits using basic/universal gates.
CSC304.2	Apply the arithmetic algorithms to solve ALU operations.
CSC304.3	Analyze the truth table of digital components and identify the elements, their functions in processor architecture.
CSC304.4	Compare a hardwired / microprogrammed control unit.
CSC304.5	Classify parameters of cache and implement memory mapping techniques.
CSC304.6	Compare serial/parallel processing and ISA, PCI, USB buses.
CSC305	**Computer Graphics**
CSC305.1	Explain the basics of computer graphics, different graphics systems and applications of computer graphics
CSC305.2	Apply various algorithms for scan conversion and filling of basic graphic objects
CSC305.3	Apply 2-D geometric transformations on graphical objects.
CSC305.4	Apply line and polygon clipping algorithms on graphical objects.
CSC305.5	Apply 3D geometric transformations and construct the curves.
CSC305.6	Describe visible surface detection techniques and concepts of animation.
CSL301	**Data Structures Lab**
CSL301.1	Implement stack linear data structures & be able to handle operations like insertion, deletion, searching and traversing on them.
CSL301.2	Implement queue linear data structures & be able to handle operations like insertion, deletion, searching and traversing on them.
CSL301.3	Implement Linked list linear data structures & be able to handle operations like insertion, deletion, searching and traversing on them.
CSL301.4	Implement nonlinear data structures & be able to handle operations like insertion, deletion, searching and traversing on them
CSL301.5	Apply appropriate data structure on various evaluation problems
CSL301.6	Apply appropriate searching techniques for given problems.
CSL302	**Digital Logic & Computer Organization and Architecture Lab**
CSL302.1	Verify the truth table of logic, universal gates, and realize logic circuits using hardware.
CSL302.2	Implement combinational circuits design using hardware.
CSL302.3	Implement sequential & code conversion circuits design using hardware.
CSL302.4	Write Booth's, Restoring, and Non-Restoring algorithms for arithmetic operations using Programming language.
CSL302.5	Implement ripple carry adder, carry look ahead adder, ALU design using virtual lab.
CSL302.6	Implement ALU, memory and Cache memory designs using virtual lab.
CSL303	**Computer Graphics Lab**
CSL303.1	Implement the basic scan conversion algorithms of output primitives
CSL303.2	Execute algorithms for filled area primitives
CSL303.3	Apply 2D Transformations: Translation, Scaling, Rotation, Reflection, Shear on a graphics object
CSL303.4	Implement algorithms for clipping line and polygon
CSL303.5	Implement curve generation methods.
CSL303.6	Develop an Animation/Graphical application based on learned concepts
CSL304	**Skill based Lab Course: Object Oriented Programming with Java**
CSL304.1	Apply fundamental programming constructs.
CSL304.2	Illustrate the concept of packages, classes and objects.
CSL304.3	Elaborate the concept of strings, arrays and vectors.
CSL304.4	Implement the concept of inheritance and interfaces.
CSL304.5	Implement the concept of exception handling and multithreading.
CSL304.6	Develop GUI based application.
CSM301	**Mini Project A**
CSM301.1	Identify societal, industrial needs and formulate problem statement followed by requirement analysis.
CSM301.2	Investigate the problem through appropriate literature surveys.
CSM301.3	Design and develop solution using modern tools for the given problem
CSM301.4	Work as an individual; contribute as a team member with effective management skills and ethical values
CSM301.5	Develop effective communication / technical writing skills through project presentation, Group discussion and report writing activities.
CSM301.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
CSC401	**Engineering Mathematics-IV**
CSC401.1	Apply the concept of eigenvalues and eigenvectors in engineering problems.
CSC401.2	Apply the concepts of Complex Integration for evaluating integrals, computing residues & evaluate various contour integrals.
CSC401.3	Apply the concept of Z-transformation and inverse in engineering problems.
CSC401.4	Apply the concept of probability distribution and sampling theory to engineering problems
CSC401.5	Apply the concept of Linear Programming Problems to optimization

CSC401.6	Solve Non-Linear Programming Problems for Optimization of engineering problems.
CSC402	**Analysis of Algorithm**
CSC402.1	Determine the space and time complexity of algorithms
CSC402.2	Apply divide and conquer strategy to solve problems and calculate its complexity
CSC402.3	Apply greedy strategy to solve problems on single source shortest path and minimum spanning tree and calculate its complexity
CSC402.4	Apply dynamic programming to solve problems on single source and all pair shortest path
CSC402.5	Apply backtracking and branch and bound strategies to solve problems on decision and optimization
CSC402.6	Explain and apply string matching algorithms for finding occurrences of patterns in a text
CSC403	**Database Management System**
CSC403.1	Understand the need of database management system
CSC403.2	Draw ER and EER diagram for real life applications
CSC403.3	Construct relational model and write relational algebra queries.
CSC403.4	Formulate SQL queries
CSC403.5	Apply the concept of normalization to relational database design.
CSC403.6	Describe the concept of transaction, concurrency and recovery
CSC404	**Operating System**
CSC404.1	Understand the objectives, functions and structure of OS
CSC404.2	Analyze the concept of process management and evaluate performance of processscheduling algorithms.
CSC404.3	Understand and apply the concepts of synchronization and deadlocks
CSC404.4	Evaluate performance of Memory allocation and replacement policies
CSC404.5	Understand the concepts of file management.
CSC404.6	Apply concepts of I/O management and analyze techniques of disk scheduling.
CSC405	**Microprocessor**
CSC405.1	Describe the core concepts of 8086 microprocessor.
CSC405.2	Write assembly and mixed language programs using instruction set of 8086.
CSC405.3	Apply the concepts of memory and peripheral chips to interface 8086 based system.
CSC405.4	Describe the fundamentals of 80386DX processor.
CSC405.5	Illustrate the core concepts of Pentium Processor.
CSC405.6	Compare 8086 with advanced processors and understand the hyper-threading technology.
CSL401	**Analysis of Algorithm Lab**
CSL401.1	Implement and analyze time complexity of sorting algorithms
CSL401.2	Implement divide and conquer approaches to solve problems and analyze its complexity
CSL401.3	Implement greedy algorithms for solving dijkstras, minimum spanning tree and fractional knapsack
CSL401.4	Implement dynamic programming algorithm for all pair shortest path and 0/1 knapsack
CSL401.5	Implement backtracking and branch and bound for 15 puzzle , N queen and sum of subset problem
CSL401.6	Analyze the performance of string matching techniques
CSL402	**Database Management System Lab**
CSL402.1	Draw ER /EER diagram and convert to relational model for the real world application.
CSL402.2	Apply DDL and DML commands
CSL402.3	Apply DCL and TCL commands
CSL402.4	Write simple and complex queries
CSL402.5	Use PL / SQL Constructs
CSL402.6	Understand the concept of concurrent transactions execution and frontend-backend connectivity
CSL403	**Operating System Lab**
CSL403.1	Demonstrate basic Operating system Commands, Shell scripts, System Calls and API wrt Linux
CSL403.2	Implement various process scheduling algorithms and evaluate their performance.
CSL403.3	Implement and analyze concepts of synchronization and deadlocks.
CSL403.4	Implement various Memory Management techniques and evaluate their performance.
CSL403.5	Implement and analyze concepts of virtual memory.
CSL403.6	Demonstrate and analyze concepts of file management and I/O management techniques.
CSL404	**Microprocessor Lab**
CSL404.1	Write assembly language programs to perform basic arithmetic operations on 8-bit/16-bit data.
CSL404.2	Write assembly language programs using INT 10H and INT 21H.
CSL404.3	Write assembly language programs based on string instructions.
CSL404.4	Write assembly language programs using procedure and macro.
CSL404.5	Write a mixed language program.
CSL404.6	Write programs for 8086 interfacing with peripheral chips.
CSL405	**Skill Base Lab Course: Python Programming**
CSL405.1	Apply basic concepts of python to implement input, output, control statements and data types
CSL405.2	Implement file processing, text processing and directory management functions of python
CSL405.3	To develop program for data structure using built in functions in python
CSL405.4	Develop GUI based web applications. perform database operations and create web applications using Django
CSL405.5	Apply multithreading concepts using python
CSL405.6	Apply and use Numpy and Pandas

CSM401	**Mini Project 1-B**
CSM401.1	Identify societal, industrial needs and formulate problem statement followed by requirement analysis.
CSM401.2	Investigate the problem through appropriate literature surveys.
CSM401.3	Design and develop solution using modern tools for the given problem
CSM401.4	Work as an individual; contribute as a team member with effective management skills and ethical values
CSM401.5	Develop effective communication / technical writing skills through project presentation, Group discussion and report writing activities.
CSM401.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
CSC501	**Computer Networks**
CSC501.1	Understand the concepts of data communication at physical layer and compare ISO - OSI model with TCP/IP model.
CSC501.2	Apply different design issues like services, framing, flow and error control at data link layer.
CSC501.3	Design the network using IP addressing and subnetting / supernetting schemes.
CSC501.4	Analyze transport layer protocols and congestion control algorithms
CSC501.5	Describe HTTP, SMTP, Telnet, FTP, DHCP, DNS protocols in application layer
CSC501.6	Describe enterprise network design and software defined network
CSC502	**Web Computing**
CSC502.1	Understand the fundamental concepts related to web applications.
CSC502.2	Apply the JavaScript to add functionality to web pages.
CSC502.3	Apply the concepts of React for designing frontend application.
CSC502.4	Apply the concepts of Node for designing backend application.
CSC502.5	Apply the concepts of Express for designing an application with Node.
CSC502.6	Apply the concepts of advance React for designing frontend application.
CSC503	**Artificial Intelligence**
CSC503.1	Identify PEAS descriptors and TASK environment of a rational agent
CSC503.2	Compare and contrast among different types of intelligent agent and the types of environment they encounter
CSC503.3	Solve given problem using informed and uninformed search techniques
CSC503.4	Apply the concept of knowledge base & reasoning to any intelligent agent using FOPL, Prolog, resolution.
CSC503.5	Apply Bayes Rule and reasoning for bayesian belief network
CSC503.6	Identify the various components of expert system for real world AI problems
CSC504	**Data Warehousing & Mining**
CSC504.1	Apply dimensional modelling concepts to construct data warehouse and perform OLAP operations.
CSC504.2	Apply pre-processing techniques and prepare the data needed for data mining.
CSC504.3	Apply the data mining technique like classification to solve real world problems.
CSC504.4	Apply data mining technique like clustering to solve real world problems.
CSC504.5	Apply data mining techniques like frequent pattern mining and association rule mining on large datasets.
CSC504.6	Understand the concepts related to Web Mining.
CSDLO5 01X	**Department Level Optional Course- 1**
CSDLO5011	**Statistics for Artificial Intelligence & Data Science**
CSDLO5011.1	Apply principles of descriptive statistics for solving the problems of Exploratory Data Analysis.
CSDLO5011.2	Apply the descriptive statistic principles for understanding Data and Sampling Distributions
CSDLO5011.3	Apply the principles of inferential statistics for solving and performing Statistical Experiments and Significance Testing
CSDLO5011.4	Apply all descriptive statistical as well as inferential statistical principles for Summarizing Data
CSDLO5011.5	Apply the parametric and non-parametric test principles to solve the Analysis of Variance.
CSDLO5011.6	Apply parametric statistical principles to solve the Linear Least Squares method.
CSDLO5012	**Advanced Algorithms**
CSDLO5012.1	Analyze the classification of problems into various NP classes and their Computational Intractability
CSDLO5012.2	Describe, apply and analyze the complexity of Approximation Algorithms.
CSDLO5012.3	Describe, apply and analyze the complexity of Randomized Algorithms.
CSDLO5012.4	Describe, apply and analyze the complexity of Local Search Algorithms.
CSDLO5012.5	Design and Apply the concepts of String and Amortized Analysis
CSDLO5012.6	To Understand Combinatorial Analysis techniques
CSDLO5013	**Internet of Things**
CSDLO5013.1	Describe the Characteristics and Conceptual Framework of IoT
CSDLO5013.2	Differentiate between the levels of the IoT architectures
CSDLO5013.3	Analyze the IoT access technologies
CSDLO5013.4	Illustrate various edge to cloud protocol for IoT
CSDLO5013.5	Apply IoT analytics and data visualization
CSDLO5013.6	Analyze and evaluate IoT applications
CSL501	**Web Computing and Network Lab**
CSL501.1	Apply the concepts of HTML to develope web pages.
CSL501.2	Apply the concepts of CSS to format the developed web pages appropriately.
CSL501.3	Apply the concepts of Bootstrap for developing responsive layout.
CSL501.4	Apply the concepts of JavaScript to make the web pages interactive.
CSL501.5	Apply the concepts of React for developing the frontend and Node/Express for backend part of the application.
CSL501.6	Apply the concepts of Computer Networking and simulate the environment using Cisco Packet Tracer.
CSL502	**Artificial Intelligence Lab**
CSL502.1	Identify PEAS descriptors and TASK environment of an Artificial Intelligent agent
CSL502.2	Identify suitable agent architecture for rational agent

CSL502.3	Apply uninformed & informed searching strategy to design problem solving agent
CSL502.4	Implement simple programs using prolog
CSL502.5	Apply Bayes Rules, FOPL to derive inferences from an intelligent agent
CSL502.6	Construct bayesian belief network or design an expert system for an intelligent agent to derive inferences from it
CSL503	**Data Warehousing & Mining Lab**
CSL503.1	Build a data warehouse using dimensional modeling concepts.
CSL503.2	Analyze data using OLAP operations so as to take strategic decisions.
CSL503.3	Organize and Prepare the data needed for data mining using pre preprocessing techniques.
CSL503.4	Implement the data mining methods like classification and clustering to solve real world problems.
CSL503.5	Implement the data mining method like Frequent Pattern mining on large data sets.
CSL503.6	Implement Web Mining algorithms.
CSL504	**Business Communication and Ethics-II**
CSL504.1	Write effective business/ technical documents.
CSL504.2	Relate and apply strategies for personal and professional skills to meet the demands of the industry
CSL504.3	Apply various techniques to be successful in group discussions, technical presentation and meeitngs.
CSL504.4	Deliver successful professional presentations.
CSL504.5	Develop creative thinking and interpersonal skills.
CSL504.6	Apply codes of ethical conduct & organizational behaviour.
CSM501	**Mini Project: 2 A**
CSM501.1	Identify societal, industrial needs and formulate problem statement followed by requirement analysis.
CSM501.2	Investigate the problem through appropriate literature surveys.
CSM501.3	Design and develop solution using modern tools for the given problem
CSM501.4	Work as an individual; contribute as a team member with effective management skills and ethical values.
CSM501.5	Develop effective communication / technical writing skills through project presentation, Group discussion and report writing activities.
CSM501.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
CSC601	**Data Analytics and Visualization**
CSC601.1	Understand basics of data analytics.
CSC601.2	Apply various regression models on a given data set and perform prediction.
CSC601.3	Analyse various time series models
CSC601.4	Analyse text data for insights.
CSC601.5	Apply different analytics and visualization techniques using R programming.
CSC601.6	Apply different analytics and visualization techniques using Python
CSC602	**Cryptography and System Security**
CSC602.1	Identify information security goals using classical encryption techniques
CSC602.2	Apply different encryption & decryption techniques to solve problems related to confidentiality & authentication.
CSC602.3	Describe cryptographic hash functions and message digest algorithms to check data integrity.
CSC602.4	Apply different digital signature algorithm to achieve authentication
CSC602.5	Describe security mechanism in an operating system and database system
CSC602.6	Apply security basics for different attacks on networks
CSC603	**Software Engineering and Project Management**
CSC603.1	Understand the fundamentals of Software Engineering.
CSC603.2	Apply estimation techniques for software development.
CSC603.3	Describe the different design models.
CSC603.4	Describe the concept of risk and configuration management.
CSC603.5	Understand the different types of software testing and maintenance.
CSC603.6	Apply the project Management concepts to develop the network diagram and schedule the projects.
CSC604	**Machine Learning**
CSC604.1	Explain and illustrate the basic concepts of Machine Learning.
CSC604.2	Apply mathematical foundation concepts for Machine Learning models.
CSC604.3	Apply Least Square Method, Regression Techniques and SVM for Classification.
CSC604.4	Select suitable Machine learning models for a given problem.
CSC604.5	Build Neural Network based models.
CSC604.6	Apply Dimensionality Reduction techniques.
CSDLO6 01X	**Department Level Optional Course -2**
CSDLO6011	**High Performance Computing**
CSDLO6011.1	Understand the fundamentals of parallel Computing.
CSDLO6011.2	Design a parallel algorithm for searching problem and compare it with sequential algorithm.
CSDLO6011.3	Design a parallel algorithm to solve computational problem and identify issues in parallel programming.
CSDLO6011.4	Analyze the performance of parallel computing system for clusters in terms of execution time, total parallel overhead, and speed up
CSDLO6011.5	Create HPC programming paradigm for parallel applications
CSDLO6011.6	Develop high performance parallel programming using open CL.
CSDLO6012	**Distributed Computing**
CSDLO6012.1	Demonstrate knowledge of the basic elements and concepts related to distributed system technologies.
CSDLO6012.2	Illustrate the middleware technologies that support distributed applications such as RPC, RMI and Object based middleware.
CSDLO6012.3	Analyze the various techniques used for clock synchronization and mutual exclusion
CSDLO6012.4	Demonstrate the concepts of Resource and Process management and synchronization algorithms

CSDLO6012.5	Demonstrate the concepts of Consistency and Replication Management
CSDLO6012.6	Apply the knowledge of Distributed File System to analyze various file systems like NFS, AFS and the experience in building large-scale distributed applications
CSDLO6013	**Image & Video processing**
CSDLO6013.1	To understand the fundamentals of digital image processing.
CSDLO6013.2	To apply image enhancement techniques to recognize their impact on images.
CSDLO6013.3	To apply image segmentation techniques to recognize their impact on images.
CSDLO6013.4	To understand the fundamentals of image transformation.
CSDLO6013.5	To apply image compression techniques to identify their impact on images.
CSDLO6013.6	To understand the fundamentals of video processing.
CSL601	**Data Analytics and Visualization Lab**
CSL601.1	Explore various data analytics Libraries in R and Python.
CSL601.2	Implement various Regression techniques for prediction.
CSL601.3	Build various time series models on a given data set.
CSL601.4	Design Text Analytics Application on a given data set.
CSL601.5	Implement visualization techniques to given data sets using R.
CSL601.6	Implement visualization techniques to given data sets using Python.
CSL602	**Cryptography & System Security Lab**
CSL602.1	Apply the knowledge of symmetric cryptography to implement simple ciphers
CSL602.2	Analyze and implement public key algorithms like RSA and El Gamal
CSL602.3	Analyze and evaluate performance of hashing algorithms
CSL602.4	Explore the different network reconnaissance tools to gather information about networks
CSL602.5	Use tools like sniffers, port scanners and other related tools for analyzing packets in a network.
CSL602.6	Apply and set up firewalls and intrusion detection systems using open source technologies and to explore email security.
CSL603	**Software Engineering and Project Management Lab**
CSL603.1	To understand the fundamentals of DevOps engineering and be fully proficient with DevOps terminologies, concepts, benefits, and deployment options to meet your business requirements
CSL603.2	To obtain complete knowledge of the ―version control systeml to effectively track changes augmented with Git and GitHub
CSL603.3	Understand the importance of Selenium and Jenkins to test Software Applications
CSL603.4	To understand the importance of Jenkins to Build and deploy Software Applications on server environment
CSL603.5	To understand concept of containerization and Analyze the Containerization of OS images and deployment of applications over Dockerk.
CSL603.6	To Synthesize software configuration and provisioning using Ansible.
CSL604	**Machine Learning Lab**
CSL604.1	Implement a Regression techniques for a given dataset.
CSL604.2	Apply Support Vector Machine for given problem.
CSL604.3	Implement various machine learning model.
CSL604.4	Apply suitable Machine learning models for a given problem.
CSL604.5	Implement Neural Network based models.
CSL604.6	Apply Dimensionality Reduction Techniques.
CSL605	**Skill base Lab Course: Cloud Computing**
CSL605.1	Implement different types of virtualization techniques.
CSL605.2	Analyze various cloud computing service models and implement them to solve the given problems.
CSL605.3	Design and develop real world web applications and deploy them on commercial cloud(s).
CSL605.4	Explain major security issues in the cloud and mechanisms to address them.
CSL605.5	Explore various commercially available cloud services and recommend the appropriate one for the given application.
CSL605.6	Implement the concept of containerization
CSM601	**Mini Project Lab: 2B**
CSM601.1	Identify societal, industrial needs and formulate problem statement followed by requirement analysis.
CSM601.2	Investigate the problem through appropriate literature surveys.
CSM601.3	Design and develop solution using modern tools for the given problem
CSM601.4	Work as an individual; contribute as a team member with effective management skills and ethical values.
CSM601.5	Develop effective communication / technical writing skills through project presentation, Group discussion and report writing activities.
CSM601.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
CSC701	**Deep Learning**
CSC701.1	Understand basic knowledge of Neural Networks.
CSC701.2	Apply the knowledge of Neural Networks in training Deep Neural Networks.
CSC701.3	Apply knowledge of unsupervised learning concept in Autoencoder
CSC701.4	Apply knowledge of supervised learning concept in CNN .
CSC701.5	Apply knowledge of sequence learning concept in RNN
CSC701.6	Understand recent trends and applications of Deep Learning.
CSC702	**Big Data Analytics**
CSC702.1	Identify issues and challenges in Big data analytics.
CSC702.2	Apply Hadoop and MapReduce techniques to solve real world problems.
CSC702.3	Identify suitable NoSQL systems to handle big data.
CSC702.4	Apply filtering techniques, counting distinct element and counting ones in window algorithms on data stream.
CSC702.5	Analyze case study of Big data applications
CSC702.6	Apply statistical computing techniques and graphics for analyzing big data using R programming language.

CSDO 701X	**Department Level Optional Course-3**
CSDO7011	**Natural Language Processing**
CSDO7011.1	Demonstrate understanding of Natural Language Processing Fundamentals
CSDO7011.2	Apply Tokenization, Stemming, Regular Expression, Finite State Machine and N-gram techniques for performing Word Level Analysis
CSDO7011.3	Apply Part of Speech Tagging techniques on the given data and parse the data for performing Syntactic Analysis
CSDO7011.4	Demonstrate understanding of lexeme relations and apply appropriate technique for performing Word Sense Disambiguation
CSDO7011.5	Apply the concepts like Referring Expressions, Referents, Coreference and Coreference Resolution for performing discourse analysis
CSDO7011.6	Apply Natural Language Processing Techniques for Designing NLP Applications
CSDO7012	**AI for Healthcare**
CSDO7012.1	Explain the role of AI and ML for handling Healthcare data.
CSDO7012.2	Apply Advanced AI algorithms and computational techniques for Healthcare Problems.
CSDO7012.3	Use evaluation metrics for evaluating healthcare systems
CSDO7012.4	Develop NLP applications for healthcare using various NLP Techniques.
CSDO7012.5	Understand ways to monitor health care data
CSDO7012.6	Apply AI and ML algorithms for building Healthcare Applications
CSDO7013	**Neural Network & Fuzzy System**
CSDO7013.1	Acquire basic knowledge of fuzzy set theory properties and relations.
CSDO7013.2	Implement Fuzzy operations towards Fuzzy-rule creations.
CSDO7013.3	Gain familiarity with the training and implementation of Associative Memory Network.
CSDO7013.4	Understand the architecture and basics components of Unsupervised learning networks.
CSDO7013.5	Analyze the significance and working of the Special Networks.
CSDO7013.6	Interpret Hybrid System to analyze the Principles of Soft computing in Neuro-Fuzzy applications.
CSDO 702X	**Department Level Optional Course-4**
CSDO7021	**User Experience Design with VR**
CSDO7021.1	Understand the fundamental concepts of user experience design.
CSDO7021.2	Apply the requirement gathering techniques and visual design principles for understanding the user's needs.
CSDO7021.3	Create interactive and functional prototype for usability.
CSDO7021.4	Apply usability testing to improve the user interface design
CSDO7021.5	Apply various sensory I/P and O/P system for user engagement in Virtual Reality system
CSDO7021.6	Build VR system for various scenarios
CSDO7022	**Blockchain Technologies**
CSDO7022.1	Understand the basic concept of Blockchain and Distributed Ledger Technology.
CSDO7022.2	Interpret the knowledge of the Bitcoin network, nodes, keys, wallets and transactions.
CSDO7022.3	Understand the concept of Ethereum and Smart Contracts using different development frameworks.
CSDO7022.4	Understand the concept of Hyperledger Fabric, different development tools and frameworks.
CSDO7022.5	Interpret the knowledge of Cryptocurrencies and Crypto assets.
CSDO7022.6	Apply the Blockchain principles to various areas of application.
CSDO7023	**Game Theory for Data Science**
CSDO7023.1	Analyze and Discuss the notion of a strategic game and equilibria and identify the characteristics of main applications of these concepts.
CSDO7023.2	Discuss the use of Nash Equilibrium for other problems. Identify key strategic aspectsand based on these be able to connect them to appropriate game theoretic concepts given a real world situation.
CSDO7023.3	Identify some applications that need aspects of Bayesian Games. Implement a typicalVirtual Business scenario using Game theory.
CSDO7023.4	Identify and discuss working principle of Non-Cooperative Games
CSDO7023.5	Discuss the Mechanism for Design Aggregating Preferences
CSDO7023.6	Identify and discuss working principle : Repeated Games
ILO 701X	**Institute Level Optional Course-1**
ILO7011	**Product Lifecycle Management**
ILO7011.1	Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.
ILO7011.2	Illustrate various approaches and techniques for designing and developing products.
ILO7011.3	Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc.
ILO7011.4	Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant
ILO7012	**Reliability Engineering**
ILO7012.1	Understand and apply the concept of Probability to engineering problems
ILO7012.2	Apply various reliability concepts to calculate different reliability parameters
ILO7012.3	Estimate the system reliability of simple and complexsystems
ILO7012.4	Carry out a Failure Mode Effect and Criticality Analysis
ILO7013	**Management Information System**
ILO7013.1	Identify the impact of information systems on an organization.
ILO7013.2	Use tools and technologies to access database information for improving business performance and decision making.
ILO7013.3	Identify the threats to information systems and apply security controls for IS.
ILO7013.4	Identify use of social computing for business-shopping, Marketing, Operational and Analytical CRM, E-business and E-commerce.
ILO7013.5	Use technologies that underlie pervasive computing, providing examples of how businesses can utilize each one.
ILO7013.6	Identify the Transaction Processing, Functional Area Information and ERP system for enterprise-wide knowledge management
ILO7014	**Design of Experiments**
ILO7014.1	Plan data collection, to turn data into information and to make decisions that lead to appropriate action
ILO7014.2	Apply the methods taught to real life situations

ILO7014.3	Plan, analyze, and interpret the results of experiments
ILO7015	**Operation Research**
ILO7015.1	Solve the LP problems using simplex algorithm and Interpret the optimum solution of it
ILO7015.2	Perform sensitivity analysis on LPP problem and Solve specialized LPP problems like the transportation and assignment problems
ILO7015.3	Plan optimum network models like the shortest path, minimum spanning tree, and maximum flow problems.
ILO7015.4	Identify queuing model for single server and multi-server models, Poisson input, exponential service, constant rate service, finite, and infinite population.
ILO7015.5	Solve simulation problem using Monte Carlo Technique
ILO7015.6	: Identify Inventory models for Classical EOQ Models, EOQ Model with Price Breaks, EOQ with Shortage, Probabilistic EOQ Model,
ILO7016	**Cyber Security and Laws**
ILO7016.1	Understand the concept of cybercrime, cybercriminal types with their motives and legal issues with respect to cybercrime.
ILO7016.2	Identify cyberattacks and discover security challenges presented by mobile devices.
ILO7016.3	Identify tools and methods used in cyber line to perform cyberattack.
ILO7016.4	Apply different aspects of cyber law.
ILO7016.5	Interpret IT Act with respect to Cybercrime and Criminal justice.
ILO7016.6	Apply Information Security Standard compliances during software design and development.
ILO7017	**Disaster Management & Mitigation Measures**
ILO7017.1	Identify the effects of Disasters by understanding the scenario of disasters in India
ILO7017.2	Compare Manmade and Natural disasters and their extent and possible effects on the economy
ILO7017.3	Categorize the Government Policies, acts and administration based on the level of Disaster
ILO7017.4	Employ the knowledge of Institutional Framework for Disaster Management in India
ILO7017.5	Apply the knowledge of Financing and Relief Measures
ILO7017.6	Utilize the of Preventive and Mitigation Measures to act during the disasters
ILO7018	**Energy Audit and Management**
ILO7018.1	To identify and describe present state of energy security and its importance.
ILO7018.2	To identify and describe the basic principles and methodologies adopted in energy audit of an utility.
ILO7018.3	To describe the energy performance evaluation ofsome common electrical installations and identify the energy saving opportunities.
ILO7018.4	To describe the energy performance evaluation ofsome common thermal installations and identify the energy saving opportunities
ILO7018.5	To analyze the data collected during performance evaluation and recommend energy saving measures
ILO7019	**Development Engineering**
ILO7019.1	Demonstrateunderstanding of knowledge for Rural Development.
ILO7019.2	Prepare solutions for Management Issues.
ILO7019.3	Take up Initiatives and design Strategies to complete the task
ILO7019.4	Develop acumen for higher education and research.
ILO7019.5	Demonstrate the art of working in group of different nature
ILO7019.6	Develop confidence to take up rural project activities independently
CSL701	**Deep Leaning Lab**
CSL701.1	Implement basic neural network models
CSL701.2	Design and train feedforward neural networks using various learning algorithms and optimize model performance
CSL701.3	Build and train deep learning models such as Autoencoders.
CSL701.4	Build and train deep learning models such as CNN.
CSL701.5	Build and train deep learning models such as RNN, LSTM
CSL701.6	Describe tools which uses DeepFake technology
CSL702	**Big Data Analytics Lab**
CSL702.1	Use Sqoop tool in Hadoop ecosystem for big data analytics.
CSL702.2	Implement Map Reduce algorithm on structured and unstructured data
CSL702.3	Perform NoSQL commands on Cassandra, Hadoop HBase and MongoDB
CSL702.4	Implement filtering, counting distinct element and counting ones in window algorithms on data stream.
CSL702.5	Implement data visualization techniques on social network graphs using R
CSL702.6	Built real life application on big data analytics
CSDOL 701X	**Department Level Optional Course-3 Lab**
CSDOL7011	**Natural Language Processing Lab**
CSDOL7011.1	Understanding of current NLP implementations and applications.
CSDOL7011.2	Using Word Level Analysis implementations with Tokenization, Lemmatization etc.
CSDOL7011.3	Using Syntax Analysis for Parts of Speech and Parts of Speech Tagging.
CSDOL7011.4	Using Semantic Analysis for implementation of corpus.
CSDOL7011.5	Implementation of core NLP concepts for modern applications.
CSDOL7011.6	Implementation of Mini-Project through a full fledged application.
CSDOL7012	**AI for Healthcare Lab**
CSDOL7012.1	Understanding preprocessing in Health Care data
CSDOL7012.2	Apply EDA on heath care data
CSDOL7012.3	Understand computational models of AI.
CSDOL7012.4	Analyze and justify the performance of specific models as applied to healthcare problems.
CSDOL7012.5	Apply NLP in healthcare domain
CSDOL7012.6	Design and implement AI based healthcare applications
CSDOL7013	**Neural Network & Fuzzy System Lab**

CSDOL7013.1	Implement Fuzzy operations and functions towards Fuzzy-rule creations.
CSDOL7013.2	Build and training Associative Memory Network.
CSDOL7013.3	Build Unsupervised learning based networks .
CSDOL7013.4	Design and implement architecture of Special Networks
CSDOL7013.5	Implement Neuro-Fuzzy hybrid computing applications
CSDOL7013.6	
CSDOL 702X	**Department Level OptionalCourse-4 Lab**
CSDOL7021	**User Experience Design with VR Lab**
CSDOL7021.1	Demonstrate the installation process of Unity and Visual Studio on computer
CSDOL7021.2	Demonstrate the working of VR Controller
CSDOL7021.3	Create VR scenes for 2D games in Unity
CSDOL7021.4	Create User interface for virtual world in Unity
CSDOL7021.5	Create 3D game in Unity
CSDOL7021.6	Create virtual environment for application in Unity
CSDOL7022	**Blockchain Technologies**
CSDOL7022.1	Apply the concept of blockchain using Truffle.
CSDOL7022.2	Apply the concept of Smart Contract and deploy on Ethereum test networks.
CSDOL7022.3	Apply the concept of Smart Contract and deploy using Remix IDE and Metamask.
CSDOL7022.4	Design and develop Cryptocurrency.
CSDOL7022.5	Write and deploy chain code in Hyperledger Fabric.
CSDOL7022.6	Develop and test a Full-fledged DApp using Ethereum/Hyperledger.
CSDOL7023	**Game Theory for Data Science**
CSDOL7023.1	Gain a solid understanding of fundamental game theory concepts
CSDOL7023.2	Develop the ability to apply game theory principles to real-world data science problems.
CSDOL7023.3	Analyze and identify Nash equilibria in various game scenarios
CSDOL7023.4	Comprehend the implications and applications of mixed strategies in game theory.
CSDOL7023.5	Acquire practical skills in utilizing game theory algorithms and computational tools.
CSDOL7023.6	Explore and appreciate the wide range of applications of game theory in data science.
CSP701	**Major Project1**
CSP701.1	Explore beyond the curriculum to identify problem of society, industrial or research needs; investigate the problem through in-depth literature survey and propose appropriate solution to solve the problem.
CSP701.2	Implement the methodology with modern tools and provide sustainable solution with effective utilization of the resources available.
CSP701.3	Analyze and compare the results with the standard results.
CSP701.4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective.
CSP701.5	Write and present their work effectively with ethical values.
CSP701.6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.
CSC801	**Advanced Artificial Intelligence**
CSC801.1	Acquire basic knowledge of Probabilistic Models.
CSC801.2	Analyze the working and architecture for Generative Networks.
CSC801.3	Interpret various components and various types of Autoencoders
CSC801.4	Understand various aspects of Transfer Learning
CSC801.5	Apply ensemble learning techniques to real-world problems and demonstrate improved predictive performance.
CSC801.6	Relate to the nascent technologies in the field of artificial intelligence
CSDO 801X	**Department Level Optional Course-5**
CSDO8011	**AI for financial & Banking application**
CSDO8011.1	Gain knowledge of technology's influence on financial and banking enterprises.
CSDO8011.2	Understand the applications of blockchain in the financial sector.
CSDO8011.3	Recognize digital money transfer mechanisms and its role in digitization
CSDO8011.4	Evaluate the advantages of digitization and cloud services in banking.
CSDO8011.5	Analyze enterprise software solutions for financial operations.
CSDO8011.6	Explore the integration of AI in banking processes.
CSDO8012	**Quantum Computing**
CSDO8012.1	Understand basic concepts of quantum computing
CSDO8012.2	Illustrate building blocks of quantum computing through architecture and programming models.
CSDO8012.3	Appraise various mathematical models required for quantum computing
CSDO8012.4	Discuss various quantum hardware building principles
CSDO8012.5	Identify the various quantum algorithms
CSDO8012.6	Describe usage of tools for quantum computing
CSDO8013	**Reinforcement Learning**
CSDO8013.1	Understand different types of robots, specifications of Robots its characteristics and applications
CSDO8013.2	Understanding Direct – Inverse kinematics of robotic manipulator.
CSDO8013.3	Identify actuators, sensors, and control of a robot for different applications
CSDO8013.4	Developing the differential relationships of motion, velocities and dynamic analysis of force
CSDO8013.5	Developing perspectives on AI and Robotics
CSDO8013.6	Developing footprints of algorithms, programming associated with Robots and conceptualizing self-configuring Robots and use of Robots in different applications
CSDO 802X	**Department Level Optional Course -6**

CSDO8021	**Graph Data Science**
CSDO8021.1	Demonstrate a solid understanding of graph concepts and properties.
CSDO8021.2	Apply graph algorithms to solve puzzles and optimization problems
CSDO8021.3	Compare graph databases with relational and NoSQL databases.
CSDO8021.4	Model data using the labeled property graph model and avoid common pitfalls
CSDO8021.5	Build graph database applications with proper data modeling and testing
CSDO8021.6	Analyze and implement graph database solutions for real-world use cases, considering non-functional characteristics
CSDO8022	**Recommendation Systems**
CSDO8022.1	To have a broad understanding of the field of Recommendation Systems.
CSDO8022.2	In-depth Knowledge of the architecture and models for Collaborative Filtering
CSDO8022.3	Understanding the architecture and working of Content based recommendation systems.
CSDO8022.4	Understanding the architecture and basics of Knowledge based recommendation systems.
CSDO8022.5	Analyzing hybrid and ensembles recommendation systems
CSDO8022.6	Evaluation of recommendation systems by selecting right evaluation parameter.
CSDO8023	**social media Analytic**
CSDO8023.1	Understand the concept of Social media
CSDO8023.2	Understand the concept of social media Analytics and its significance.
CSDO8023.3	Learners will be able to analyze the effectiveness of social media
CSDO8023.4	Learners will be able to use different Social media analytics tools effectively and efficiently.
CSDO8023.5	Learners will be able to use different effective Visualization techniques to represent social media analytics.
CSDO8023.6	Acquire the fundamental perspectives and hands-on skills needed to work with social media data.
ILO80X	**Institute Level Optional Course-2**
ILO8021	**Project Management**
ILO8021.1	Apply selection criteria and select an appropriate project from different options
ILO8021.2	Write work break down structure for a project and develop a schedule based on it
ILO8021.3	Identify opportunities and threats to the project and decide an approach to deal with them strategically.
ILO8021.4	Use Earned value technique and determine & predict status of the project
ILO8021.5	Capture lessons learned during project phases and document them for future reference
ILO8022	**Finance Management**
ILO8022.1	Understand Indian finance system and corporate finance
ILO8022.2	Take investment, finance as well as dividend decisions
ILO8023	**Entrepreneurship Development and Management**
ILO8023.1	Understand the concept of business plan and ownerships
ILO8023.2	Interpret key regulations and legal aspects of entrepreneurship in India
ILO8023.3	Understand government policies for entrepreneurs
ILO8024	**Human Resource Management**
ILO8024.1	Understand the concepts, aspects, techniques and practices of the human resource management
ILO8024.2	Understand the Human resource management (HRM) processes, functions, changes and challenges in today's emerging organizational perspective.
ILO8024.3	Gain knowledge about the latest developments and trends inHRM
ILO8024.4	Apply the knowledge of behavioral skills learnt and integrate it with in inter personal and intergroup environment emerging as future stable engineers and managers.
ILO8025	**Professional Ethics and CSR**
ILO8025.1	Understand rights and duties of business
ILO8025.2	Distinguish different aspects of corporate social responsibility
ILO8025.3	Demonstrate professional ethics
ILO8025.4	Understand legal aspects of corporate social responsibility
ILO8026	**Research Methodology**
ILO8026.1	Prepare a preliminary research design for projects in their subject matter areas
ILO8026.2	Accurately collect, analyze and report data
ILO8026.3	Present complex data or situations clearly
ILO8026.4	Review and analyze research findings
ILO8027	**IPR and Patenting**
ILO8027.1	understand Intellectual Property assets
ILO8027.2	assist individuals and organizations in capacity building
ILO8027.3	work for development, promotion, protection, compliance, and enforcement of Intellectual Property and Patenting
ILO8028	**Digital Business Management**
ILO8028.1	Identify drivers of digital business
ILO8028.2	Illustrate various approaches and techniques for E-business and management
ILO8028.3	Prepare E-business plan
ILO8029	**Environmental Management**
ILO8029.1	Make use of knowledge of Environment Management for sustainable development
ILO8029.2	Identify the Environmental Concerns for the specific hazard
ILO8029.3	Apply the Concept of Ecology to know the interdependence between ecosystem and living organisms
ILO8029.4	Apply the concept of Corporate Env Responsibility for Environmental Quality Management
ILO8029.5	Categorize the ISO-14000 standards and understand the procedure of EMS Certification

ILO8029.6	Utilize the knowledge of Environmental legislations for sustainable development
CSL801	**Advanced AI Lab**
CSL801 .1	Implement Fuzzy operations and functions towards Fuzzy-rule creations.
CSL801 .2	Build and training Associative Memory Network
CSL801 .3	Build Unsupervised learning based networks
CSL801 .4	Design and implement architecture of Special Networks
CSL801 .5	mplement Neuro-Fuzzy hybrid computing applications.
CSDOL8011	**AI for financial & Banking application Lab**
CSDOL8011 .1	Proficiency in implementing secure and efficient digital money transfer systems
CSDOL8011 .2	Ability to assess investment performance using risk-adjusted measures
CSDOL8011 .3	Competence in identifying meaningful patterns and segments in financial data.
CSDOL8011 .4	Understanding of market sentiment and its impact on trading decisions.
CSDOL8011 .5	Practical skills in developing and evaluating trading algorithms.
CSDOL8011 .6	Knowledge of fraud detection methods for financial systems.
CSDOL8012	**Quantum Computing Lab**
CSDOL8012 .1	Implement basic quantum computing logic by building dice and random numbers using open source simulation tools
CSDOL8012 .2	Understand quantum logic gates using open source simulation tools.
CSDOL8012 .3	Implement quantum circuits using open source simulation tools
CSDOL8012 .4	I implement quantum algorithms using open source simulation tools.
CSDOL8013	**Reinforcement Learning Lab**
CSDOL8013.1	Gain a solid understanding of reinforcement learning concepts and problem formulation.
CSDOL8013.2	Evaluate and compare exploration strategies in online learning scenarios.
CSDOL8013.3	Solve Markov Decision Processes using dynamic programming algorithms
CSDOL8013.4	Apply dynamic programming techniques to solve small-scale MDP problems.
CSDOL8013.5	Implement and analyze Monte Carlo methods and Temporal-Difference learning algorithms
CSDOL8013.6	Explore practical applications of reinforcement learning in real-world domains
CSDOL8021	**Graph Data Science Lab**
CSDOL8021 .1	Comprehensive understanding of graph databases and their benefits
CSDOL8021 .2	Proficiency in creating data models for representing complex relationships
CSDOL8021 .3	Ability to write efficient queries and analyze graph data effectively
CSDOL8021 .4	Competence in administering and managing graph databases.
CSDOL8021 .5	Application of graph database techniques to solve real-world problems
CSDOL8021 .6	Understand developing graph database applications.
CSDOL8022	**Recommendation Systems Lab**
CSDOL8022 .1	Understand mathematics and representation of data for recommendation systems
CSDOL8022 .2	Design, implement and analyze Collaborative filtering based for recommendation systems.
CSDOL8022 .3	Design, implement and analyze Content-based recommendation systems.
CSDOL8022 .4	Design, implement and analyze Knowledge-based recommendation systems.
CSDOL8022 .5	Understanding feature engineering and pre-processing for recommendation systems
CSDOL8022 .6	To solve real world problems using recommendation system
CSDOL8023	**Social Media Analytics Lab**
CSDOL8023 .1	Understand characteristics and types ofsocial media networks
CSDOL8023 .2	Use social media analytics tools for business
CSDOL8023 .3	Collect, monitor , store and track social media data
CSDOL8023 .4	Analyze and visualize social media data from multiple platforms
CSDOL8023 .5	Design and develop content and structure based social media analytics models.
CSDOL8023 .6	Design and implement social media analytics applications for business.
CSP801	**Major Project 2**
CSP801 .1	Explore beyond the curriculum to identify problem of society, industrial or research needs; investigate the problem through in-depth literature survey and propose appropriate solution to solve the problem.
CSP801 .2	Implement the methodology with modern tools and provide sustainable solution with effective utilization of the resources available.
CSP801 .3	Analyze and compare the results with the standard results.
CSP801 .4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective.
CSP801 .5	Write and present their work effectively with ethical values.
CSP801 .6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.

Dr. Vikas Gupta,
Head of Department,
Computer Science and Engineering
(Data Science),Vidyavardhinis College of
Engineering and Technology, Vasai west.