



VidyaVardhini's college of Engineering & Technology Vasai(w)
Department of Artificial Intelligence and 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.	
Program Specific Outcomes	
PSO1: Analyze the currents trends in the field of Artificial Intelligence and Data Science and convey their findings by presenting/ publishing at national/ international forums..	
PSO2: Design and develop Artificial Intelligence and Data Science based solutions and applications for the problems in the different domains catering to industry and society.	
Course Outcomes	
	At the end of the semester student will able to
Applied Mathematics I	
FEC101	Apply the concepts of Complex Numbers, to solve Engineering problems.
FEC101.1	Apply hyperbolic functions and logarithm of complex number to solve Engineering problems.
FEC101.2	Apply Compute the partial differentiation of functions of two & three variables.
FEC101.3	Apply find the nth order derivative of a function using successive differentiation & Compute maxima-minima of a function.
FEC101.4	Apply the properties of matrices to find rank of a matrix & to solve system of linear simultaneous equations.
FEC101.5	Apply the concept of Numerical Methods to solve system of linear algebraic equations, transcendental equation.
FEC101.6	
Applied Physics I	
FEC102	Know the fundamentals of quantum mechanics and its applications.
FEC102.1	Draw miller indices using concept of crystallography and Identify crystal structure using X-ray diffraction techniques viz. Bragg's diffractometer
FEC102.2	Apply concepts of semiconductor physics to understand principle and working of LED, photoconductor and photovoltaic cell.
FEC102.3	Use concept of interference in thin films in measurements.
FEC102.4	Discuss properties of superconductors and super capacitor.
FEC102.5	Know the principles of engineering materials.
FEC102.6	
Applied Chemistry I	
FEC103	Analyze the quality of water and suggest methods of treatment.
FEC103.1	Differentiate thermosoftening & thermosetting plastic & select appropriate fabrication method.
FEC103.2	Understand the concept of microscopic chemistry in terms of atomic and molecular orbital theory & calculate bond order of molecule.
FEC103.3	Understand the concept of aromaticity & calculate aromaticity using Huckel's Rule.
FEC103.4	Understand Gibb's phase rule & calculate number of phases, component & degree of freedom of one & two component system.
FEC103.5	Differentiate ionic, dipolar & Vander waal's intermolecular forces of attraction.
FEC103.6	
Engineering Mechanics	
FEC104	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.
FEC104.1	Demonstrate the understanding of Centroid and its significance and locate the same
FEC104.2	Estimate required force to overcome friction and correlate real life application to specific type of friction.
FEC104.3	Establish relation between velocity and acceleration of a particle and analyse the motion by plotting the relation.
FEC104.4	Illustrate different types of motions and establish Kinematic relations for a rigid body.
FEC104.5	Analyse body in motion using force and acceleration, work-energy, impulse- momentum principles
FEC104.6	

FEC105	Basic Electrical Engineering
FEC105.1	Analyze DC circuits and apply Superposition, Thevenin's Norton's, Maximum power transfer theorems to determine their response.
FEC105.2	Analyse 1- Φ AC circuits and determine their response.
FEC105.3	Analyse 3- Φ circuits and determine voltage-current relationship in star and delta connection.
FEC105.4	Perform OC/SC test on 1- Φ Transformer and evaluate/determine its equivalent circuit and efficiency.
FEC105.5	Understand 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	Analyse 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
FEL104.6	
FEL105	Basic Workshop Practice I
FEL105.1	Model different prototypes in the carpentry trade such as Cross cut lap joint, Tee lap joint, Dovetail 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 solid.
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	Analyse 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 logical reasoning methods for problem solving .
CSC302.2	Apply set notations ,functions and relations for problem solving.
CSC302.3	Analyze posets and Lattice using relations .

CSC302.4	Solve problems using counting techniques .
CSC302.5	Use of groups and codes in Encoding-Decoding
CSC302.6	Use graphical terminologies to identify connected and isomorphic graphs.
CSC303	Data Structure
CSC303.1	Identify the Linear and Non Linear Data Structures for a given problem
CSC303.2	Apply insertion, deletion operations on stacks and queue data structures.
CSC303.3	Apply insertion and deletion operations on Linked Lists
CSC303.4	Apply insertion,deletion and searching operations on AVL, B Tree, B+ Tree, Expression Tree, Huffman Encoding
CSC303.5	Examine Graph Traversal algorithms to determine shortest path and connectivity between nodes
CSC303.6	Select appropriate searching technique and hashing function for a database application
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	Represent points in two/three-dimension graphical coordinate systems and compare raster scan & random scan displays.
CSC305.2	Apply scan conversions algorithms to draw point, line, circle, ellipse and compare flood fill, boundary fill algorithms.
CSC305.3	Apply 2-D geometric transformations on graphical objects and analyze composite transformation.
CSC305.4	Apply line and polygon clipping algorithms on 2D graphical objects.
CSC305.5	Apply 3D geometric transformations on graphical objects and construct the curves.
CSC305.6	Classify visible surface detection techniques and compare conventional/traditional and computer-based animation techniques.
CSL301	Data Structures Lab
CSL301.1	Implement Linear Data Structure and handle insertion, deletion, traversal operations using array.
CSL301.2	Apply stack operations to convert and evaluate expression
CSL301.3	Implement linear, circular or priority queues using arrays
CSL301.4	Implement Singly, Circular or Doubly Linked list
CSL301.5	Implement Abstract data type using Linked list
CSL301.6	Implement Graph Traversal Techniques: BFS and DFS.
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 C-Programming language.
CSL302.5	Implement ripple carry adder, carry look ahead adder, ALU design using virtual lab.
CSL302.6	Implement CPU, memory and Cache memory designs using a virtual lab.
CSL303	Computer Graphics Lab
CSL303.1	Represent points in two/three-dimension graphical coordinate systems and compare raster scan & random scan displays.
CSL303.2	Apply scan conversions algorithms to draw point, line, circle, ellipse and compare flood fill, boundary fill algorithms.
CSL303.3	Apply 2-D geometric transformations on graphical objects and analyze composite transformation.
CSL303.4	Apply line and polygon clipping algorithms on 2D graphical objects.
CSL303.5	Apply 3D geometric transformations on graphical objects and construct the curves.
CSL303.6	Classify visible surface detection techniques and compare conventional/traditional and computer-based animation techniques.
CSL304	Skill based Lab Course: Object Oriented Programming with Java
CSL304.1	Apply programming constructs of decision making and looping for solving arithmetic problems.
CSL304.2	Apply the concept of packages, classes and objects for solving given problem.
CSL304.3	Use strings, arrays and vectors for solving given problem.
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 statements 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 Algorithms
CSC402.1	Calculate the Space and Time Complexity of algorithms
CSC402.2	Apply Divide and Conquer approach to solve problems and analyze its complexity
CSC402.3	Apply Greedy Methods to solve problems on Single source shortest path and Minimum spanning tree, and analyze its complexity
CSC402.4	Apply Dynamic Programming Approaches to solve problems on Single source and All pair shortest path
CSC402.5	Apply backtracking, and branch & bound strategies to solve problems on decision and optimization
CSC402.6	Apply String Matching techniques for finding the occurrences of patterns in a text
CSC403	Database Management System
CSC403.1	Identify characteristics of database management system.
CSC403.2	Design ER/EER diagram for given case study.
CSC403.3	Construct relational model and apply relational algebra queries for a given problem.
CSC403.4	Apply SQL queries for a given schema.
CSC403.5	Apply normalization techniques to relational database design.
CSC403.6	Use transaction, concurrency and recovery techniques to analyze conflicts in multiple transactions.
CSC404	Operating System
CSC404.1	Identify the objectives, functions and structure of the operating system.
CSC404.2	Analyze performance of Process Scheduling algorithms based on CPU utilization and throughput.
CSC404.3	Use process synchronization techniques for deadlock detection, prevention, recovery.
CSC404.4	Analyze performance of memory allocation based on space complexity and page replacement policies based on time complexity.
CSC404.5	Use concepts of file management to access, share and manipulate file systems.
CSC404.6	Evaluate performance of disk scheduling algorithms using concepts of I/O management.
CSC405	Microprocessor
CSC405.1	Identify the components and their functions in Intel 8086 microprocessors.
CSC405.2	Write assembly, mixed language programs using instruction set of 8086 and analyze updated values of control flag after execution of assembly language
CSC405.3	Design 8086 microprocessor-based system for the given specifications using memory and peripheral chips.
CSC405.4	Identify the components and their functions in Intel 80386DX processor.
CSC405.5	Identify the components and their functions in the Pentium processors.
CSC405.6	Compare 8086, 80386, Pentium I, II, III and Identify the components, their functions for Pentium 4: Net burst microarchitecture.
CSL401	Analysis of Algorithms Lab
CSL401.1	Implement and Analyze Time Complexity of Insertion and Selection sort algorithms
CSL401.2	Implement Divide and Conquer approaches to solve problems and analyze its complexity
CSL401.3	Implement Greedy Algorithms for Single source shortest path, Fractional Knapsack, Minimum cost spanning trees
CSL401.4	Implement Dynamic Programming algorithms for Single source shortest path, All pairs Shortest path, 0/1 Knapsack Problem, Travelling Salesperson Problem
CSL401.5	Implement Backtracking, and Branch and Bound algorithms for Nqueen Problem, Sum of Subset Problem, Travelling Salesperson Problem, 15 puzzle problem
CSL401.6	Implement String Matching Techniques
CSL402	Database Management system Lab
CSL402.1	Design ER and EER diagram for the real life problem with software tool.
CSL402.2	Construct database tables with different DDL and DML statements and apply integrity constraints
CSL402.3	Apply SQL queries ,triggers for given Schema
CSL402.4	Apply procedure and functions for given schema
CSL402.5	Use transaction and concurrency control techniques to analyze conflicts in multiple transactions.
CSL402.6	Construct database tables and JDBC/ ODBC connectivity for given application
CSL403	Operating System Lab
CSL403.1	Use the Linux commands to write Shell scripting program using system calls.
CSL403.2	Analyze the performance of process scheduling algorithms based on CPU utilization and throughput.
CSL403.3	Write a program for deadlock detection and avoidance algorithm using C programming language.
CSL403.4	Analyze the performance of memory management techniques based on space complexity.
CSL403.5	Analyze the performance of virtual memory management algorithms based on time complexity.
CSL403.6	Write a program for file management and I/O management techniques using C programming language.
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 for 16-bit addition, subtraction, multiplication, and division (menu based)
CSL404.3	Write assembly language programs based on string instructions.
CSL404.4	Write assembly language program using procedure.
CSL404.5	Write assembly language programs using macros.
CSL404.6	Write a mixed language program.

CSL405	Skill Base Lab Course: Python Programming
CSL405.1	Apply concepts of Input / Output, control statements and object oriented programming in python for performing arithmetic operations
CSL405.2	Use features of files, directories and regular expression in python for file manipulation
CSL405.3	Implement linked list, stacks, queues and dequeues data structures
CSL405.4	Develop Graphical User Interface, perform database operations and create web applications with Django web framework
CSL405.5	Implement multi-threading in python
CSL405.6	Use NumPy and Pandas packages for matrix manipulation and data analysis
CSM401	Mini Project B
CSM401.1	Identify societal, industrial needs and formulate problem statements 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	Apply the concepts of data communication and appropriate topologies for end-to-end communication.
CSC501.2	Apply communication mechanisms like services, framing, error detection, error correction, multiple access control for flow control.
CSC501.3	Apply Subnetting, Network Address Translation and routing algorithms for shortest paths.
CSC501.4	Apply sliding window technique for TCP flow control and SMTP, HTTP, Telnet for sending emails.
CSC501.5	Apply Cisco Service oriented network model and classic three-layer hierarchical model for Enterprise Network Design.
CSC501.6	Apply Software Defined Network approach and methodology to manage dynamic and programmatically efficient network.
CSC502	Web Computing
CSC502.1	Identify different protocols or technologies required for various web application
CSC502.2	Apply Javascript to add functionality to web pages.
CSC502.3	Develop front end application using React
CSC502.4	Develop back end application using node.js
CSC502.5	Construct web based Node.js applications using Express
CSC502.6	Develop back end application using functional components of react
CSC503	Artificial Intelligence
CSC503.1	Identify PEAS descriptors and TASK Environment of an rational agent.
CSC503.2	compare and contrast among different types of intelligent agent and the types of environment they encounter .
CSC503.3	Apply informed and uninformed search techniques to solve given problem.
CSC503.4	Apply the concept of knowledge and reasoning to intelligent agent using PROLOG programming.
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 and mining
CSC504.1	Design a data warehouse for a given application and perform OLAP operations to take business decisions.
CSC504.2	Apply pre-processing techniques for a given data set to perform data cleaning, data transformation, data reduction, and data discretization
CSC504.3	Apply decision tree induction and Bayesian classification on a given data set for prediction
CSC504.4	Apply Partition and Hierarchical Clustering algorithms on a given data set to form the clusters
CSC504.5	Apply association mining techniques to identify interesting patterns
CSC504.6	Apply web mining algorithms on a given data for deriving complex information
CSDL5011	Statistics In AI&DS
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.
CSDL5011	Statistics In AI&DS
CSDL5013	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	Identify and apply the appropriate HTML tags to develop a webpage
CSL501.2	Identify and apply the appropriate CSS tags to format data on webpage
CSL501.3	Build responsive websites using Bootstrap
CSL501.4	Apply JavaScript to develop interactive web pages.
CSL501.5	Build front end applications using React and back end using Node.js/express
CSL501.6	Use simulator for Cisco packet tracer/GNS3
CSL502	Artificial Intelligence Lab
CSL502.1	Identify PEAS descriptors and TASK Environment of an Intelligent agent.
CSL502.2	Apply Uninformed searching algorithms for problem solving
CSL502.3	Apply Informed searching algorithms for problem solving
CSL502.4	Implement simple programs using PROLOG.
CSL502.5	Represent natural language description as statements in Logic and apply inference rules to it.

CSL502.6	Case study of successful AI System.
CSL503	Data Warehouse & Mining Lab
CSL503.1	Apply dimensional modeling concepts to construct data warehouses.
CSL503.2	Analyze data using OLAP operations so as to make strategic decisions.
CSL503.3	Apply pre processing techniques to organize and prepare the data needed for data mining.
CSL503.4	Implement 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 to solve real world problems.
CSL504	Business Communication and Ethics 2
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 meetings.
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 2A
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	Analyze various time series model
CSC601.4	Analyze 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 and decryption techniques to solve problems related to confidentiality and authentication
CSC602.3	Apply Cryptographic hash function and message digest algorithms to check data integrity
CSC602.4	Apply Different digital Signature algorithms to achieve authentication
CSC602.5	Apply security mechanism on operating system and database system
CSC602.6	Apply security basics for different attacks on network
CSC603	Software Engineering and Project Management
CSC603.1	Understand the fundamentals of Software Engineering
CSC603.2	Apply estimation techniques for software development
CSC603.3	Apply design principles to design a model
CSC603.4	Apply RMMM plan for risk management
CSC603.5	Apply various testing techniques for testing the developed product
CSC603.6	Apply the project management concepts to develop the n/w diagram and schedule the project
CSC604	Machine Learning
CSC604.1	Identify a Machine Learning Technique for the given problem and understand its performance metrics.
CSC604.2	Apply System of Linear equations, Length of vector and the concept of Symmetric Positive Definite Matrices on the given data to understand mathematical modeling of Machine Learning Models.
CSC604.3	Apply the different methods of Linear model for Regression and Classification.
CSC604.4	Apply Hebbian Learning Rule and Expectation-Maximization algorithm for clustering.
CSC604.5	Apply concept of Neural Network to design simple network and understand Perceptron Learning Rule and Logistic Regression for classification.
CSC604.6	Use Dimensionality Reduction techniques for dealing with data with large number of attributes
CSDL6011	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.
CSDL6013	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 and 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 Gammal
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 system using open source technologies and email security
CSL603	Software Engineering and Project Management Lab
CSL603.1	Understood the fundamentals of DevOps engineering and be fully proficient with DevOps concepts
CSL603.2	Implement Git & Git Hub to achieve Version Control
CSL603.3	Implement selenium and Jenkins to test software applications
CSL603.4	Implement to build and deploy software applications
CSL603.5	Implement Docker to containerize images and deploy applications
CSL603.6	Implement Puppet to synthesize software configuration and provisioning
CSL604	Machine Learning Lab
CSC604.1	Identify different libraries used for Data processing like Numpy , Pandas and Matplotlib.
CSC604.2	Apply System of Linear equations, Length of vector and the concept of Symmetric Positive Definite Matrices on the given data to understand mathematical modeling of Machine Learning Models.
CSC604.3	Apply the different methods of Linear model for Regression and Classification.
CSC604.4	Apply Hebbian Learning Rule and Expectation-Maximization algorithm for clustering.
CSC604.5	Apply concept of Neural Network to design simple network and understand Perceptron Learning Rule and Logistic Regression for classification.
CSC604.6	Use Dimensionality Reduction techniques for dealing with data with large number of attributes
CSL605	Skill Based Lab Course: Cloud Computing
CSL605.1	Create virtual machines using open source technology.
CSL605.2	Compare cloud computing services SaaS/PaaS/IaaS for a given application
CSL605.3	Design and develop real world web applications and deploy them on commercial clouds.
CSL605.4	Deploy cloud services to address security issues .
CSL605.5	Identify commercially available cloud services and recommend the appropriate one for the given application.
CSL605.6	Implement the concept of containerization.
CSM501	Mini Project 2B
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.
CSC701	Deep Learning
CSC701.1	Understand the fundamental concepts in neural network and deep learning
CSC701.2	Compare and Contrast among activation functions, loss functions, optimizers and regularization for choosing the appropriate method for the given application
CSC701.3	Compare and Contrast among different types of Autoencoders for choosing the appropriate method for the given application
CSC701.4	Apply the concepts of Convolution Neural Network on the given data
CSC701.5	Compare and Contrast among different types of Recurrent Neural Network for choosing the appropriate method for the given application
CSC701.6	Apply appropriate deep learning techniques for the given application
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.
CSDO7011	Natural Language Processing
CSDC7013.1	Demonstrate understanding of Natural Language Processing Fundamentals
CSDC7013.2	Apply Tokenization, Stemming, Regular Expression, Finite State Machine and N-gram techniques for performing Word Level Analysis
CSDC7013.3	Apply Part of Speech Tagging techniques on the given data and parse the data for performing Syntactic Analysis
CSDC7013.4	Demonstrate understanding of lexeme relations and apply appropriate technique for performing Word Sense Disambiguation
CSDC7013.5	Apply the concepts like Referring Expressions, Referents, Coreference and Coreference Resolution for performing discourse analysis
CSDC7013.6	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
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 various VR systems using DECIDE framework
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.
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 Analytic 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
ILO7016	Cyber Security and Laws
ILO7016.1	Illustrate the concept of cybercrime, cyber-frauds, cybercriminal types with their motives with respect to cybercrime.
ILO7016.2	Analyze and discriminate cyberattack types with tools used for attacks.
ILO7016.3	Identify the security challenges presented by mobile devices and infer measures for protecting the same.
ILO7016.4	Discover and apply different aspects of cyber law and Information Security Standards compliance.
ILO7016.5	Discover and understand different aspects of cyber laws.
ILO7016.6	Distinguish different aspects of cyber crime and Indian IT Act.
CSL701	Deep Learning Lab
CSL701.1	Implement Multilayer Perceptron to solve the given problem
CSL701.2	Design a deep neural network by choosing appropriate training, optimization and regularization techniques to solve the given problem
CSL701.3	Design an appropriate Autoencoder architecture to solve the given problem
CSL701.4	Design an appropriate Convolution Neural Network architecture to solve the given problem
CSL701.5	Design an appropriate Recurrent Neural Network architecture to solve the given problem
CSL701.6	Build a Deep Learning Application
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
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 health 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
CSDOL7021	User Experience Design with VR Lab
CSDO7021.1	Demonstrate the installation process of Unity and Visual Studio on computer
CSDO7021.2	Demonstrate the working of VR Controller
CSDO7021.3	Create VR scenes for 2D games in Unity
CSDO7021.4	Create User interface for virtual world in Unity
CSDO7021.5	Create 3D game in Unity
CSDO7021.6	Create virtual environment for application in Unity
CSDL7022	Block Chain Lab
CSDL7022.1	Create Cryptographic merkle root to provide integrity
CSDL7022.2	Create digital signature to perform authentication
CSDL7022.3	Design Smart Contract using Solidity.
CSDL7022.4	Implement ethereum blockchain using Geth
CSDL7022.5	Implement ethereum blockchain using Ganache and Truffle
CSDL7022.6	Use the tool to demonstrate the concept of blockchain in real world application.
CSP701	Major Project 1
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	Analyze different Probabilistic models and choose the appropriate method for the given application
CSC801.2	Analyze the working and architecture for Generative Networks
CSC801.3	Interpret various components and various types of Autoencoders
CSC801.4	Apply the concepts of Transfer Learning on the given data
CSC801.5	Apply Ensemble Learning techniques to real-world problems
CSC801.6	Understand the nascent technologies in the field of artificial intelligence
CSDO8013	Reinforcement Learning
CSDOL8013.1	Understand different types of robots, specifications of Robots its characteristics and applications.
CSDOL8013.2	Apply the concepts of Direct and Inverse Kinematics to solve real world problems.
CSDOL8013.3	Identify actuators, sensors, and control of a robot for different applications
CSDOL8013.4	Applying the differential relationships of motion, velocities and dynamic analysis of force
CSDOL8013.5	Applying perspectives on AI and Robotics
CSDOL8013.6	Applying the fundamentals of robotics for automation
CSDO8022	Recommendation Systems
CSDO8022.1	Apply principles of Linear Algebra as a pre-requisite for the Recommendation Systems.
CSDO8022.2	Apply the approaches for performing collaborative filtering.
CSDO8022.3	Apply the approaches for performing content-based recommendation.
CSDO8022.4	Apply the approaches for performing knowledge based recommendation.
CSDO8022.5	Apply the approaches for performing ensemble based and hybrid recommendation system.
CSDO8022.6	Apply the approaches for meticulously evaluating recommendation systems.
ILO8021	Project Management
ILO8021.1	Identify appropriate projects from various options and mention their selection criteria.
ILO8021.2	Prepare Project Charter for the selected project
ILO8021.3	Prepare Work Break Down Structure for a project and also prepare a schedule using GANTT chart, CPM, PERT

ILO8021.4	Identify opportunities and threats to decide risk response strategy of a project.
ILO8021.5	Apply Earned Value Management techniques to determine & predict status of the project and implement project termination process.
ILO8021.6	Identify reasons of project termination
ILO8025	Professional Ethics and CSR
ILO8025.1	Understand rights and duties of business.
ILO8025.2	Analyze and explore duties of business and professional ethics in the marketplace.
ILO8025.3	Analyze and Demonstrate professional ethics of consumer protection and job discrimination.
ILO8025.4	Describe and analyze different aspects of corporate social responsibility
ILO8025.5	Analyze interrelatedness of enterprises and corporate social responsibility.
ILO8025.6	Understand legal aspects of corporate social responsibility.
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 Artificial Intelligence Lab
CSL801.1	Design and Implement a Probabilistic Model for predicting outcomes
CSL801.2	Design a GAN on to solve the given problem
CSL801.3	Design an appropriate Variational Autoencoder architecture to solve the given problem
CSL801.4	Apply the concept of Transfer Learning on the given dataset
CSL801.5	Apply Ensemble Learning techniques to real-world problems
CSL801.6	Build an Application by making use of Advanced AI concepts
CSDOL8013	Reinforcement Learning Lab
CSDOL8013.1	Apply the fundamentals of reinforcement learning and problem formulation using MDPs and Bandit problems
CSDOL8013.2	Apply different exploration strategies and their impact on online leaning scenarios.
CSDOL8013.3	Apply dynamic programming algorithms for solving Markov Decision Processes.
CSDOL8013.4	Apply dynamic programming techniques to solve small-scale MDP problems
CSDOL8013.5	Implement and compare Monte Carlo methods and Temporal-Difference learning algorithms.
CSDOL8013.6	Apply real-world applications of reinforcement learning in domains such as autonomous driving or robotics
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 systems.
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.