Vidyavardhini's college of Engineering & Technology Vasai(w)
Department of Computer Engineering
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 problems and design applications of database, networking, security, web technology, cloud computing, machine learning using mathematical skills, and computational tools.	
PSO2: Develop computer-based systems to provide solutions for organizational, societal problems by working in multidisciplinary teams and pursue a career in the IT industry.	
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
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, 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 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 indiviual , 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 indiviual , 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	**Theoretical Computer Science**
CSC501.1	Apply NFA/DFA techniques for pattern matching.
CSC501.2	Construct Finite Automata for the given regular expresssion.
CSC501.3	Apply specified well defined rules for syntax verification.
CSC501.4	Design ,pushdown automata to recognize the language.
CSC501.5	Design Turing machine for formal language.
CSC501.6	Use compatibility, decidability, undecidability, complexity classes for formal languages.
CSC502	**Software Enginnering**
CSC502.1	Select process models for software project development.
CSC502.2	Identify requirements, analyze, and prepare Software Requirement Specification document format (IEEE).
CSC502.3	Apply Software Estimation techniques.
CSC502.4	Prepare effective project schedule.
CSC502.5	Design, develop the software projects & identify risks, manage the change to assure quality in software projects.
CSC502.6	Apply testing principles on software projects & maintenance models.
CSC503	**Computer Network**
CSC503.1	Apply appropriate topologies for end to end communication.
CSC503.2	Compare Twisted pair, Coaxial, Fiber optics transmission media.
CSC503.3	Analyze algorithms for error detection, error correction, multiple access control and identify IP Addressing.
CSC503.4	Analyze routing and congestion control algorithms.
CSC503.5	Apply sliding Window technique for TCP Flow control.
CSC503.6	Use HTTP, SMTP, Telnet, FTP, DHCP protocol at application layer.
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
CSDO501	**Internet Programming**
CSDLO5012.1	Develop responsive web page(s) using HTML and CSS
CSDLO5012.2	Design interactive web site using JavaScript
CSDLO5012.3	Develop web page(s) with server side processing using servlets and JSP
CSDLO5012.4	Develop rich internet application web page(s) using AJAX
CSDLO5012.5	Develop web page(s) with XML and PHP extensions
CSDLO5012.6	Develop web applications using React js
CSDO501	**Advanced Database Management System**
CSDLO5013.1	Design distributed database using query processing techniques.
CSDLO5013.2	Analyze query processing ,transaction and concurrency management techniques to avoid conflicts in multiple transactions.
CSDLO5013.3	Organize the data using XML and JSON database for better interoperability.
CSDLO5013.4	Compare different types of NoSQL databases.
CSDLO5013.5	Formulate NoSQL queries using MongoDB.
CSDLO5013.6	Compare various trends in advance databases through temporal, graph based and spatial based databases.
CSL501	**Software Engineering Lab**
CSL501.1	Identify requirements and apply software process model to a given case study.
CSL501.2	Design Data Flow Diagrams for given case study.
CSL501.3	Use software engineering tools for project scheduling and preparation of WBS.
CSL501.4	Develop architectural models for the selected case study.
CSL501.5	Develop test cases for the given case study on white box testing.
CSL501.6	Use computer-aided software engineering (CASE) tools.
CSL502	**Computer Network Lab**
CSL502.1	Use network simulator NS3 to explore networking algorithms and protocols.
CSL502.2	Implement and analyze routing strategies for an IP based networking infrastructure.
CSL502.3	Implement and analyze TCP/UDP socket programming for Chatting Application.

CSL502.4	Apply Linux networking commands for packet filtering.
CSL502.5	Use Network tools and simulators such as NS2, Wireshark etc. to explore networking algorithms and protocols
CSL502.6	Use network simulator NS3 to explore networking algorithms and protocols.
CSL503	**Data Warehousing and Mining Lab**
CSL503.1	Design data warehouse and perform OLAP operations on a given input.
CSL503.2	Implement Pre-processing and Classification algorithms on a given data set.
CSL503.3	Implement Clustering algorithms on a given data set.
CSL503.4	Implement association rule mining algorithm on a given data set.
CSL503.5	Implement Web Mining algorithms on a given data set.
CSL503.6	Simulate Clustering, Classification and Association mining algorithms using WEKA tool
CSL504	**Business Comm. & 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 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	**System Programming & Compiler Construction**
CSC601.1	Distinguish between application and system programs.
CSC601.2	Design of single pass and two pass assembler.
CSC601.3	Design of two pass macro processor, absolute loader and direct linking loader.
CSC601.4	Demonstrate the compilation process for given program statement.
CSC601.5	To solve the parsing problems using appropriate parsing techniques.
CSC601.6	Apply Intermediate code generation and code optimization techniques on given input program statement.
CSC602	**Cryptography & System Security**
CSC602.1	Use classical encryption techniques for data encryption.
CSC602.2	Apply symmetric and asymmetric key cryptography to solve confidentiality and authentication problems
CSC602.3	Analyze the cryptographic hash functions and message digest algorithms to check data integrity
CSC602.4	Analyze the cryptographic hash functions and message digest algorithms to check data integrity
CSC602.5	Evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP.
CSC602.6	Examine malicious code using system security concepts.
CSC603	**Mobile Computing**
CSC603.1	Identify basic concepts and principles in mobile communication & computing, cellular architecture.
CSC603.2	Identify the components and functioning of mobile networking.
CSC603.3	Classify Medium Access, Internet and Transport Layer Protocols in Mobile networking.
CSC603.4	Apply the concepts of WLAN for local as well as remote applications.
CSC603.5	Apply the concepts of mobility management to solve security issues in Mobile Computing.
CSC603.6	Identify the components of Long-Term Evolution (LTE) architecture.
CSC604	**Artificial Intelligencee**
CSC604.1	Identify the types of environment and illustrate the working of intelligent agents
CSC604.2	Solve given problem using uninformed and informed search techniques.
CSC604.3	Solve given problem using local search and adversarial search techniques
CSC604.4	Use knowledge representation language for knowledge presentation and apply reasoning techniques to solve given problem.
CSC604.5	Use planning techniques to generate a plan for given planning problem.
CSC604.6	Analyze the real world AI applications.
CSDLO6011	**Internet of Things(IoT)**
CSDLO6011.1	Identify the characteristics and challenges of an IoT application.
CSDLO6011.2	Select appropriate Sensor, Actuators and implement methodology, sensor network for an IoT application.
CSDLO6011.3	Design and manage communication network and process data for an IoT application.
CSDLO6011.4	Select appropriate protocols for web based IoT application.
CSDLO6011.5	Design smart IoT application for societal and industrial need.
CSDLO6011.6	Construct an IoT application using Arduino/Raspberry Pi
CSDLO6013	**Quantitative Analysis**
CSDLO6013.1	Examine the problem and identify the appropriate presentation method
CSDLO6013.2	Analyze the problem and identify the suitable data collection and the sampling method

CSDLO6013.3	Analyze the data using Regression for the purpose of estimation
CSDLO6013.4	Analyze the data using Multiple Linear Regression for the purpose of estimation
CSDLO6013.5	Analyze the data and identify the appropriate Statistical inference method
CSDLO6013.6	Analyze the data and perform testing of hypothesis
CSL601	**System Programming & Compiler Construction Lab**
CSL601.1	Design and develop databases for two pass assembler with data structure.
CSL601.2	Design and develop two pass Macro-Processor with data structure.
CSL601.3	Implement Lexical analyzer phase of compiler
CSL601.4	Implement syntax analyzer phase of compiler.
CSL601.5	Implement synthesis phase of compiler.
CSL601.6	Implement synthesis phase of compiler.
CSL602	**Cryptograpghy & System Security Lab**
CSL602.1	Implement classical encryption techniques
CSL602.2	Implement symmetric and asymmetric key cryptography
CSL602.3	To analyze performance of hashing algorithm
CSL602.4	To Apply digital signature algorithm to verify integrity and achieve authentication
CSL602.5	To use network reconnaissance tools to gather information about networks and use tools like sniffers and ARP spoofing
CSL602.6	To use various attacks like buffer-overflow and web application attack
CSL603	**Mobile Computing Lab**
CSL603.1	Develop and demonstrate mobile applications using frequency reuse and Bluetooth technologies.
CSL603.2	Implement Code Division Multiple Access (CDMA) to test the orthogonality and autocorrelation of a code.
CSL603.3	Implement security algorithms for mobile communication network
CSL603.4	Configure the access point of Wi-Fi
CSL603.5	Develop mobile application using GUI components and database.
CSL603.6	Use GPS location tracking technology in an application.
CSL604	**Artificial Intelligence Lab**
CSL604.1	Analyze PEAS descriptors of an Intelligent agent.
CSL604.2	Implement Uninformed searching algorithms for problem solving
CSL604.3	Implement Informed searching algorithms for problem solving.
CSL604.4	Create a knowledge base using any AI language.
CSL604.5	Create Inference system using reasoning technique for given AI problem
CSL604.6	Identify the components of AI applications in the field of NLP and Healthcare.
CSL605	**Skill base 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.
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.
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	**Machine Learning**
CSC701.1	Identify a Machine Learning technique for the given problem and understand the concepts of Training Error, Generalization Error, Overfitting and Underfitting
CSC701.2	Apply Regression and Decision Tree techniques on the given data and examine the performance of the model
CSC701.3	Compare and Contrast Ensemble approaches for combining multiple Machine Learning Techniques
CSC701.4	Determine the type of Support Vector Machines variant which can applied on the given data
CSC701.5	Apply Unsupervised Learning technique on the given data for getting insights from unlabeled data
CSC701.6	Use Dimensionality Reduction techniques for dealing with data with large number of attributes
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.
CSDC7011	**Machine Vision**
CSDC7011.1	Describe the components of Machine Vision
CSDC7011.2	Perform transformation and interpolation for image, video pre-processing
CSDC7011.3	Identify hardware and software components for machine vision applications
CSDC7011.4	Apply filtering and segmentation techniques for preprocessing of digital image
CSDC7011.5	Apply motion analysis techniques on video for motion tracking
CSDC7011.6	Analyze the case study of machine vision applications
CSDC7013	**Natural Language Processing**
CSDC7013.1	Identify Challenges of NLP and ambiguities in natural language
CSDC7013.2	Apply Morphological analysis approaches on the given data.
CSDC7013.3	Apply Syntactic analysis approaches on the given data
CSDC7013.4	Apply Semantic Analysis techniques on the given data.
CSDC7013.5	Apply Pragmatic and Discourse Analysis techniques on the given data.
CSDC7013.6	Design NLP based application.
CSDC7021	**Augmented and Virtual Reality**
CSDC7021.1	Describe working of VR systems
CSDC7021.2	Apply geometric presentation of the virtual world and its operations
CSDC7021.3	Apply the concepts of motion and tracking in VR systems to real world problem
CSDC7021.4	Apply the knowledge of hardware that enables VR systems while developing it.
CSDC7021.5	Apply the knowledge of working of AR systems to analyze the hardware requirement of AR.
CSDC7021.6	Apply the knowledge of AR concepts to select a problem statement which has a better candidature for AR system.
CSDC7022	**Block Chain**
CSDC7022.1	Explain general blockchain concepts
CSDC7022.2	Apply the knowledge of Cryptocurrency Wallets used in the blockchain
CSDC7022.3	Apply the concepts of smart contracts used in the blockchain
CSDC7022.4	Apply the concept of public blockchain technology
CSDC7022.5	Illustrate the various private blockchain technologies
CSDC7022.6	Evaluate various tools and applications of blockchain
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	**Machine Learning Lab**
CSL701.1	Analyze the data and Apply appropriate Regression Technique on the given Dataset
CSL701.2	Analyze the results obtained by applying appropriate Classification Technique on the given Dataset
CSL701.3	Analyze the results obtained by applying appropriate Ensemble Technique on the given Dataset
CSL701.4	Apply appropriate Unsupervised Technique on the given Dataset
CSL701.5	Analyze the results obtained by applying Dimensionality Reduction on the given dataset
CSL701.6	Build a Machine 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
CSDL7011	**Machine Vision Lab**
CSDL7011.1	Perform transformation and interpolation for image, video pre-processing
CSDL7011.2	Implement edge detection and depth estimation algorithms using canny
CSDL7011.3	Implement Object segmentation using the Watershed and GrabCut algorithms
CSDL7011.4	Perform face detection algorithms on image/video

CSDL7011.5	Implement Object detection techniques using OpenCV
CSDL7011.6	Implement Bag-of-word(BOW) algorithm to create object detector
CSDL7013	**Natural Language Processing Lab**
CSDL7013.1	Apply text processing techniques on given input
CSDL7013.2	Apply word level analysis techniques on the given data
CSDL7013.3	Apply Syntax Analysis techniques on the given data
CSDL7013.4	Apply Semantic Analysis techniques on the given data
CSDL7013.5	Apply Discourse Analysis techniques on the given data
CSDL7013.6	Design NLP based application
CSDL7021	**Augmented and Virtual Reality Lab**
CSDL7021.1	Setup VR development environment like Unity and Visual Studio
CSDL7021.2	Examine working of VR assistants like Google Cardboard, Google Daydream, Samsung gear VR and HTC Vive
CSDL7021.3	Apply the concepts to develop scene in VR environment Unity
CSDL7021.4	Apply the concept of color, material and texture to objects in a scene created in Unity
CSDL7021.5	Apply Rigid body component, material and Box collider to Game Objects
CSDL7021.6	Demonstrate use of Augmented Face Features
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	**Distributed Computing**
CSC801.1	apply the concepts of distributed systems and its types
CSC801.2	illustrate the middleware technologies that support RPC, RMI and object-based middleware
CSC801.3	analyze the techniques used for clock synchronization, mutual exclusion and deadlock
CSC801.4	use the concepts of resource and process management for designing systems
CSC801.5	use the concepts of consistency, replication management and fault tolerance for designing systems
CSC801.6	use the knowledge of distributed file systems to perform file management tasks
CSDC8012	**Digital Forensic**
CSDC8012.1	Explain the various phases of Digital Forensics and methodology to handle the security incident
CSDC8012.2	Use the process of collection, analysis and recovery of the digital evidence
CSDC8012.3	Apply the knowledge of various tools to analyze malwares and images of hard disk/RAM
CSDC8012.4	Investigate Windows and UNIX systems
CSDC8012.5	Analyze digital evidence in Mobile Devices
CSDC8012.6	Investigate Web Browser, Email and generate report
CSDC8013	**Applied Data Science**
CSDC8013.1	Understand the concepts of data science
CSDC8013.2	Apply data explorations techniques on the given data
CSDC8013.3	Apply data visualization techniques and validation techniques on the given data
CSDC8013.4	Apply anomaly detection techniques on the given data and deal with the outliers to make the data appropriate for an ML algorithm
CSDC8013.5	Analyze the performance of a model and apply time series forecasting methods
CSDC8013.6	Apply data science techniques on real world applications
CSDC8022	**High Performance Computing**
CSDC8022.1	Understand parallel and pipeline processing approaches
CSDC8022.2	Design a parallel algorithm to solve computational problems and identify issues in parallel programming.
CSDC8022.3	Analyze the performance of parallel computing systems for clusters in terms of execution time, total parallel overhead, speedup.
CSDC8022.4	Develop efficient and high-performance parallel algorithms using OpenMP and message passing paradigm
CSDC8022.5	Develop high-performance parallel programming using OpenCL and CUDA framework
CSDC8022.6	Perform the range of activities associated with High Performance Computing in Cloud Computing
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	**Distributed Computing Lab**
CSL801.1	implement message-oriented Communication or RPC/RMI based client-server programs.
CSL801.2	implement techniques for clock synchronization
CSL801.3	implement techniques for election algorithms
CSL801.4	implement mutual exclusion and deadlock handling techniques
CSL801.5	implement techniques of resource and process management
CSL801.6	implement distributed file systems
CSDL8012	**Digital Forensic Lab**
CSDL8012.1	Use various forensics tools to acquire, duplicate and analyze data and recover deleted data
CSDL8012.2	Evaluate penetration testing using forensics tools
CSDL8012.3	Use various forensics tools and use them to acquire and analyze live and static data
CSDL8012.4	Use various forensics tools to extract emails evidence
CSDL8012.5	Use various forensics tools to extract Web Browsers related evidence
CSDL8012.6	Discuss real time crime forensics
CSDL8013	**Applied Data Science Lab**
CSDL8013.1	Apply Data Explorations techniques on the given data
CSDL8013.2	Apply Data Preparation techniques on the given data
CSDL8013.3	Apply Data Visualization techniques and Validation techniques on the given data
CSDL8013.4	Detect and Deal with Anomalies in the data and imbalance in the data
CSDL8013.5	Implement Time Series forecasting on the given dataset
CSDL8013.6	Develop a Data Science Application
CSDL8022	**High Performance Computing Lab**
CSDL8022.1	Perform Linux based commands on remote machine
CSDL8022.2	Compare the performance of sequential algorithms with parallel algorithm in terms of execution time, speedup and throughput.
CSDL8022.3	Implement parallel program using OpenMP library and analyze its performance
CSDL8022.4	Implement parallel program using MPI platform and analyze its performance
CSDL8022.5	Implement parallel program using OpenCL framework and analyze its performance
CSDL8022.6	Implement parallel program using CUDA framework and analyze its performance
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.