Terna Engineering College, Nerul
Computer Engineering
CO Statements

SEM	SUBJECT CODE	SUBJECT	CO/LO	CO / LO STATEMENT
SEM-III	**CSC301**	**(Abhishek Jadhav) Applied Mathematics-III**	CO1	Understand the concept of Laplace transform and its application to solve the real integrals in engineering problems
			CO2	Understand the concept of inverse Laplace transform of various functions and its applications in engineering problems
			CO3	Expand the periodic function by using the Fourier series for real-life problems and complex engineering problems.
			CO4	Understand complex variable theory, application of harmonic conjugate to get orthogonal trajectories and analytic functions
			CO5	Apply the concept of Correlation and Regression to the engineering problems in data science, machine learning, and AI.
			CO6	Understand the concepts of probability and expectation for getting the spread of the data and distribution of probabilities
	CSC302	**(Mohini and Priyanka) Discrete Structures and and Graph Theory**	CO1	Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving.
			CO2	Ability to reason logically
			CO3	Ability to understand relations, functions, Diagraph and Lattice.
			CO4	Ability to understand and apply concepts of graph theory in solving real world problems.
			CO5	Understand use of groups and codes in Encoding-Decoding
			CO6	Analyze a complex computing problem and apply principles of discrete mathematics to
	CSC303	**(Chitre, Hole &Salunkhe)**	CO1	Student will be able to implement various linear and nonlinear data structures.

	Data Structure	CO2	Students will be able to handle operations like Insertion, Deletion, Searching, Sorting and Traversing on data structures.
		CO3	Student will be able to select appropriate sorting method for given problem.
		CO4	Student will be able to select appropriate searching method for given problem.
		CO5	Student will be able to apply the learn concepts in various domains like DBMS and compiler Construction.
		CO6	Students will be able to choose appropriate data structure for specified problem domain.
CSC304	**(Rohini Palve & Varsha) Digital Logic &Computer Architecture**	CO1	Apply number systems theory in different digital circuit design
		CO2	Apply minimization techniques and realize given Boolean functions using basic and universal gates
		CO3	To understand the basic concepts of digital components and processor organization and implement arithmetic algorithms.
		CO4	To understand the generation of control signals of computer
		CO5	Demonstrate the memory organization.
		CO6	Describe the concepts of parallel processing and different Buses.
CSC305	**(Ahire, Randeep. Kirti) Computer Graphics**	CO1	Describe the basic concepts of Computer Graphics.
		CO2	Demonstrate various algorithms for basic graphics primitives.
		CO3	Apply 2-D geometric transformations on graphical objects.
		CO4	Use various Clipping algorithms on graphical objects
		CO5	Explore 3-D geometric transformations, curve representation techniques and projections methods.
		CO6	Explain visible surface detection techniques and Animation

CSL301	**(Chitre, Hole, Salunkhe) Data Structure Lab**	LO1	Students will be able to implement linear data structures & be able to handle operations like insertion, deletion, searching and traversing on them.
		LO2	Students will be able to implement nonlinear data structures & be able to handle operations like insertion, deletion, searching and traversing on them
		LO3	Students will be able to choose appropriate data structure and apply it in various problems
		LO4	Students will be able to select appropriate searching techniques for given problems
CSL302	**(Rohini Palve. Varsha) Digital Logic & Computer Architecture Lab**	LO1	Understand the basics of digital components.
		LO2	Understand different number systems and their conversions.
		LO3	Designing digital circuits used in a Computer.
		LO4	Implement various algorithms for arithmetic operations.
		LO5	Designing Basic Building Block Of Computer.
		LO6	Designing memory subsystem including cache memory
CSL303	**(Ahire, Randeep. Kirti) Computer Graphics Lab**	LO1	Implement various line, circle, ellipse drawing algorithms.
		LO2	Implement various output and filled area primitive algorithms.
		LO3	Apply the transformations and clipping algorithms on graphical objects.
		LO4	Implement the curve and fractal generation.
		LO5	Implement 3D transformation and Parallel and Perspective projection of a 3D object on Projection Plane.
		LO6	Apply Character Generation Techniques and Develop graphical application and animation based on learned concepts.
CSL304	**Skill base Lab**	LO1	1. To apply fundamental programming constructs.

		(Ujwala, Mantale, Sakure) Object Oriented Programming with Java	LO2	2. To illustrate the concept of packages, classes and objects.
			LO3	3. To elaborate the concept of strings, arrays and vectors.
			LO4	4. To implement the concept of inheritance and interfaces.
			LO5	5. To implement the notion of exception handling and multithreading.
			LO6	6. To develop GUI based application.
	CSM301	**(Shaveta) Mini Project-1A**	CO1	Identify problems based on societal /research needs.
			CO2	Apply Knowledge and skill to solve societal problems in a group.
			CO3	Develop interpersonal skills to work as member of a group or leader.
			CO4	Draw the proper inferences from available results through theoretical/ experimental/simulations.
			CO5	Analyze the impact of solutions in societal and environmental context for sustainable development.
			CO6	Use standard norms of engineering practices
			CO7	Excel in written and oral communication.
			CO8	Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.
			CO9	Demonstrate project management principles during project work.
SEM-IV	**CSC401**	**(S.N.Patil, Deshmukh.B.P) Applied Mathematics IV**	CO1	Apply the concepts of eigenvalues and eigenvectors in engineering problems.
			CO2	Use the concepts of Complex Integration for evaluating integrals, computing residues & evaluate various contour integrals
			CO3	Apply the concept of Z- transformation and inverse in engineering problems

			CO4	Use the concept of probability distribution and sampling theory to engineering problems
			CO5	Apply the concept of Linear Programming Problems to optimization
			CO6	Solve Non-Linear Programming Problems for optimization of engineering problems.
	CSC402	**(Hole, Salunkhe, Chitre) Analysis of Algorithms**	CO1	Analyze the running time and space complexity of algorithms
			CO2	Describe, apply and analyze the complexity of divide and conquer strategy
			CO3	Describe, apply and analyze the complexity of dynamic programming strategy.
			CO4	Describe, apply and analyze the complexity of greedy strategy
			CO5	Explain and apply backtracking, branch and bound
			CO6	Explain and apply string matching techniques
	CSC403	**(Pramila, Salunkhe, Mathur) Database Management System**	CO1	Explain basic concepts of database system
			CO2	Design a data model and schemas in RDBMS
			CO3	Use RDBMS's for developing industry applications
			CO4	Be competent in use of Structured Query Language SQL
			CO5	Analyze functional dependencies for designing a robust database
			CO6	Implement transactions, concurrency control, and be able to do Database recovery and Query optimization.
	CSC404	**(Randeep, Thombre) Operating System**	CO1	Describe the role of Operating System as System Software.
			CO2	Analyze the performance of various process scheduling algorithms with the process concept.
			CO3	Interprets and devise the process synchronization problems.
			CO4	Implement the resource allocation problems with deadlock concepts.

		CO5	Evaluate the performance of Memory allocation and replacement techniques.
		CO6	Analyze different techniques of File and I/O Management.
CSC405	**(Palve, Bokefode) Microprocessor**	CO1	Describe core concepts of 8086 microprocessor
		CO2	Interpret the instructions of 8086 and write assembly and Mixed language programs.
		CO3	Explain the concept of interrupts.
		CO4	Identify and Design 8086 based system using memory and peripheral chips.
		CO5	Describe 80386 architecture and modes of operation
		CO6	Appraise the architecture of advanced processors
CSL401	**(Hole, Ankita Chitre) AOA Lab**	LO1	Analyze complexity of various algorithms
		LO2	Apply and analyze the complexity of divide and conquer strategy
		LO3	Apply and analyze the complexity of greedy strategy
		LO4	Apply and analyze the complexity of dynamic programming strategy
		LO5	Apply backtracking, branch and bound techniques
		LO6	Apply string matching techniques
CSL402	**(Pramila, Mohini) DBMS Lab**	LO1	Design and query a database using Basic SQL statements.
		LO2	Create and update database using different DDL and DML statements
		LO3	Use joins and in built functions to retrieve and manipulation data
		LO4	Create and execute database objects and DCL statements
		LO5	Apply triggers for a specific task
		LO6	Create and use view, complex queries.

CSL403	**(Randeep, Pramila)** **OS Lab**	LO1	Demonstrate the basic Operating System Commands.
		LO2	Explore various System Call.
		LO3	Execute Shell commands using kernel APIs.
		LO4	Interpret and examine different process scheduling algorithms.
		LO5	Evaluate Process management techniques and Deadlock handling simulator.
		LO6	Analyze and implement different Memory management algorithms.
CSL404	**(Bokefode, Palve)** **MP Lab**	LO1	To understand Assembler Directives
		LO2	Use appropriate instructions to program microprocessor to perform various task
		LO3	Develop the program in assembly/mixed language for Intel 8086 processor
		LO4	Use appropriate interrupts in Assembly language Programming
		LO5	Demonstrate the execution and debugging of assembly/ mixed language program
		LO6	To understand advanced processor
CSL405	**(Mohini, Raskar Nilesh)** **Skill Base Python Lab**	LO1	1. To understand basic concepts in python.
		LO2	2. To explore contents of files, directories and text processing with python
		LO3	3. To develop program for data structure using built in functions in python.
		LO4	4. To explore django web framework for developing python-based web application.
		LO5	5. To understand Multithreading concepts using python.
		LO6	To develop programs for NumPy and Pandas.
	(Raskar)	CO1	Identify problems based on societal /research needs.

	CSM401	**Mini Project-1B**	CO2	Apply Knowledge and skill to solve societal problems in a group.
			CO3	Develop interpersonal skills to work as member of a group or leader.
			CO4	Draw the proper inferences from available results through theoretical/ experimental/simulations.
			CO5	Analyze the impact of solutions in societal and environmental context for sustainable development.
			CO6	Use standard norms of engineering practices
			CO7	Excel in written and oral communication.
			CO8	Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.
			CO9	Demonstrate project management principles during project work.
SEM-V	**CSC501**	**(Rohini, Kirti, Salunkhe) Theoretical Computer Science**	CO1	Ability to identify the central concepts in theory of computation and differentiate between deterministic and nondeterministic automata, also obtain
			CO2	Ability to infer the equivalence of languages described by finite automata and regular expressions
			CO3	Ability to devise regular, context free grammars while recognizing the strings and tokens
			CO4	Ability to design pushdown automata to recognize the language.
			CO5	Ability to develop an understanding of computation through Turing Machine
			CO6	Ability to acquire fundamental understanding of decidability and undecidability

CSC502	**(Preeti Patil, Shahabade, Bokefode)** **Software Engineering**	CO1	1. Understand and demonstrate basic knowledge in software engineering.
		CO2	2. Identify requirements, analyze and prepare models.
		CO3	3. Plan, schedule and track the progress of the projects.
		CO4	4. Design & develop the software projects.
		CO5	5. Apply testing principles on software project and understand the maintenance concepts.
		CO6	6. Identify risks; manage the change to assure quality in software projects.
CSC503	**(Shahabade,Thombre,Mantale)** **Computer Network**	CO1	Demonstrate the data communication at physical layer and compare ISO - OSI model with TCP/IP model.
		CO2	Demonstrate the functioning of networking protocols used in data link layer.
		CO3	Design the network using IP addressing and sub netting / super netting schemes.
		CO4	Analyze various routing protocols and congestion control algorithms used in network layer.
		CO5	Analyze transport layer protocols and congestion control algorithms.
		CO6	Exploration of protocols used in application layer.
CSC504	**(Surekha,Mathur)** **Data Warehouse and Mining**	CO1	1. Understand and Design data warehouse with dimensional modelling and apply OLAP operations for dimensional analysis.
		CO2	2. Understand data mining principles and perform data pre-processing and visualization
		CO3	3. Compare and evaluate different classification techniques for prediction.
		CO4	4. Identify and evaluate different clustering techniques

		CO5	5. Identify the application area of data mining algorithms to frequent data sets and association Rules.
		CO6	6. Describe complex information and social networks with respect to web mining.
CSDLO501x	**(Randeep,Preeti, Pramila)** **DLOC - Internet Programming**	CO1	1. Implement interactive web page(s) using HTML and CSS(and bootstrap).
		CO2	2. Design a responsive web site using JavaScript (Dynamic HTML).
		CO3	3. Demonstrate database connectivity using JDBC (JSP and Servelets).
		CO4	4. Demonstrate Rich Internet Applications using Ajax.
		CO5	5. Demonstrate and differentiate various web extensions (PHP, XML).
		CO6	6. Demonstrate web applications using react js.
CSL501	**(Randeep,Shahabade,Bokefode)** **SE Lab**	LO1	1. Analyze and identify requirements of project (software) and apply appropriate process model.
		LO2	2. Estimate efforts and cost and able to schedule the project (software) using various project scheduling tools.
		LO3	3. Model requirements of project (software) using Data Flow Diagram (DFD) and UML
		LO4	4. Recognize and apply design principles and create user interfaces of the software.
		LO5	5. Recognize and apply different testing techniques to test the system by creating different test cases.
		LO6	6. Develop RMMM plan by performing risk analysis and manage different version of software using different SCM tools.
CSL502	**(Mantale, Thombre)** **CN Lab**	LO1	**LO1: Identify various protocols, cables and devices in networking along with their specification and proper usage.**

		LO2	**LO2: Making use of various commands and Protocols used by various layers of networking.**
		LO3	**LO3: Creating LAN, assigning IP addresses using concepts of Static/ Dynamic addressing and Error free transmission in LAN.**
		LO4	**LO4: Explore various routing algorithms and Protocols of network layer using simulator and Physical devices.**
		LO5	**LO5: Implement Transport Layer Protocols**
		LO6	**LO6: Implement Application layer protocols.**
CSL503	**(Surekha,Ujwala)** **DWM Lab**	LO1	Design data warehouse and perform various OLAP operations.
		LO2	Explore and prepare the data in data mining and identify importance of algorithms.
		LO3	Implement data mining algorithms like classification.
		LO4	Implement clustering algorithms on a given set of data sample.
		LO5	Implement Association rule mining on a given set of data samples.
		LO6	Implement page rank algorithm to web mining.
CSL504	**(Sirsat)** **BCE Lab**	LO1	Design a technical document using precise language, suitable vocabulary and apt style.
		LO2	Develop the life skills/interpersonal skills to progress professionally by building stronger relationships
		LO3	Demonstrate awareness of contemporary issues knowledge of professional and ethical responsibilities.
		LO4	Apply the traits of a suitable candidate for a job/higher education , upon being trained in the techniques of holding a group discussion, facing interviews and writing resume/SOP.
		LO5	Deliver formal presentations effectively implementing the verbal and non-verbal skills

	CSM501	**(Siddharth)** **Mini-Project-2A**	CO1	Identify societal/research/innovation/entrepreneurship problems through appropriate literature surveys
			CO2	Identify Methodology for solving above problem and apply engineering knowledge and skills to solve it
			CO3	Validate, Verify the results using test cases/benchmark data/theoretical/ inferences/experiments/simulations
			CO4	Analyze and evaluate the impact of solution/product/research/innovation /entrepreneurship towards societal/environmental/sustainable development
			CO5	Use standard norms of engineering practices and project management principles during project work
			CO6	Communicate through technical report writing and oral presentation. ● The work may result in research/white paper/ article/blog writing and publication ● The work may result in business plan for entrepreneurship product created ● The work may result in patent filing.
			CO7	Gain technical competency towards participation in Competitions, Hackathons, etc.
			CO8	Demonstrate capabilities of self-learning, leading to lifelong learning.
			CO9	Develop interpersonal skills to work as a member of a group or as leader
SEM VI	**CSC601**	**(Priyanka, Shahabade)** **(System Programming and Compiler Construction (SPCC)**	CO1	Identify the relevance of different system programs.
			CO2	Describe the various data structures and design passes of assembler.
			CO3	Design and implement macro processor.
			CO4	Distinguish different loaders & linkers & their contribution in developing effiecient user applications.

		CO5	Describe various compiler phases and implement lexical analyser & also construct different parsers for given context free grammars
		CO6	Describe the need of synthesis phase to produce the object code optimised in terms of high execution speed and less memory usage & generate target code
CSC602	**(Siddharth, Sayali Ujwala) (Cryptography and System Security (CSS)**	CO1	Understand system security goals and concepts, classical encryption techniques and acquire fundamental knowledge on the concepts of modular arithmetic and number theory.
		CO2	Understand, compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
		CO3	Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
		CO4	Apply different digital signature algorithms to achieve authentication and design secure applications
		CO5	Understand network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP.
		CO6	Analyze and apply system security concept to recognize malicious code.
CSC603	**(Sakure, Gaikwad) Mobile Computing (MC)**	CO1	To identify basic concepts and principles in computing, cellular architecture
		CO2	To describe the components and functioning of mobile networking.
		CO3	To classify variety of security techniques in mobile network
		CO4	To apply the concepts of WLAN for local as well as remote applications.

		CO5	To describe and apply the concepts of mobility management including macro and micro mobility.
		CO6	To describe Long Term Evolution (LTE) architecture and its interfaces
CSC604	**(Seema, Shaveta, Surekha) Artificial Intelligence (AI)**	**CO1**	Learn the concepts of artificial intelligence and categorization of an intelligent system.
		CO2	Identify appropriate problem solving method for an agent to find a sequence of actions to reach the goal state.
		CO3	Identify an appropriate problem solving method using heuristic approach.
		CO4	Analyze the strength and weaknesses of AI approaches to knowledge– intensive problem solving.
		CO5	Design models for reasoning with uncertainty as well as the use of unreliable information.
		CO6	Design and develop AI applications in real world scenarios.
CSDLO601x	**(Raskar, Gaurav) DLOC - Internet of Things (IOT)**	CO1	Understand the concepts of IoT and the Things in IoT.
		CO2	Emphasize core IoT functional Stack and understand application protocols for IoT.
		CO3	Apply IoT knowledge to key industries that IoT is revolutionizing.
		CO4	Examines various IoT hardware items and software platforms used in projects.
CSDLO601x	**(Archana) DLOC - Quntitative Analysis (QA)**	CO1	1. Recognize the need of Statistics and Quantitative Analysis
		CO2	2. Apply the data collection and the sampling methods.
		CO3	3. Analyze using concepts of Regression,
		CO4	4. Analyze using concepts Multiple Linear Regression
		CO5	5. Formulate Statistical inference drawing methods.
			6. Apply Testing of hypotheses
CSL605	**(Surekha,**	LO1	Implement different types of virtualization techniques.

	Bavkar) **Cloud Computing Lab (CCL)**	LO2	Analyze various cloud computing service models and implement them to solve the given problems.
		LO3	Design and develop real world web applications and deploy them on commercial cloud(s).
		LO4	Explain major security issues in the cloud and mechanisms to address them.
		LO5	Explore various commercially available cloud services and recommend the appropriate one for the given application.
		LO6	Implement the concept of containerization
CSL601	**(Shahabade, Priyanka, Ankita))** **SPCC Lab**	LO1	Generate machine code by using various databases generated in pass one of two pass assembler.
		LO2	Construct different databases of single pass macro processor.
		LO3	Identify and validate different tokens for given high level language code.
		LO4	Parse the given input string by constructing Top down /Bottom up parser.
		LO5	Implement synthesis phase of compiler with code optimization techniques.
		LO6	Explore various tools like LEX and YACC.
CSL602	**(Ujwala, Sayali, Siddharth)** **CSS Lab**	LO1	To be able to apply the knowledge of symmetric cryptography to implement simple ciphers.
		LO2	To be able to analyse and implement public key algorithms.
		LO3	To analyse and evaluate performance of hashing algorithms.
		LO4	To explore the different network reconnaissance tools to gather information about networks.
		LO5	To explore and use tools like sniffers, port scanners and other related tools for analysing packets in a network.
		LO6	To be able to explore IDS, email security and various attacks like buffer-overflow, and web-application attacks.
CSL603	**(Gaikwad, Bokefode,**	LO1	To develop and demonstrate mobile applications using various tools.

		Sakure) **MC Lab**	LO2	To articulate the knowledge of GSM, CDMA & Bluetooth technologies and demonstrate
			LO3	To carry out simulation of frequency reuse, hidden/exposed terminal .
			LO4	To implement security algorithms for mobile communication network
			LO5	Demonstrate simulation and compare the performance of Wireless LAN
			LO6	To develop mobile app using flutter/Android Studio
	CSL604	**(Surekha, Rohini, Shaveta)** **AI LAB**	LO1	To apply the basic techniques and AI Programming to build intelligent systems.
			LO2	To solve problems using uninformed and informed search techniques
			LO3	To create knowledge base and apply appropriate problem solving method for optimization.
			LO4	To design models for reasoning with uncertainty as well as the use of unreliable Information.
			LO5	Conceptualize the basic ideas of planning and learning process of a system.
			LO6	Ability to analyze and develop the AI applications in real world scenario.
	CSM601	**(Surekha, Priyanka Ujwala)** **Mini Project**	CO1	Identify societal/research/innovation/entrepreneurship problems through appropriate literature surveys
			CO2	Identify Methodology for solving above problem and apply engineering knowledge and skills to solve it
			CO3	Validate, Verify the results using test cases/benchmark data/theoretical/ inferences/experiments/simulations
			CO4	Analyze and evaluate the impact of solution/product/research/innovation /entrepreneurship towards societal/environmental/sustainable development

			CO5	Use standard norms of engineering practices and project management principles during project work
			CO6	Communicate through technical report writing and oral presentation. ● The work may result in research/white paper/ article/blog writing and publication ● The work may result in business plan for entrepreneurship product created ● The work may result in patent filing.
			CO7	Gain technical competency towards participation in Competitions, Hackathons, etc.
			CO8	Demonstrate capabilities of self-learning, leading to lifelong learning.
			CO9	Develop interpersonal skills to work as a member of a group or as leader
SEM-VIII	**CSC701**	**(Seema, Rohini, Nilesh) Machine Learning**	CO1	Students will be able to Gain knowledge about basic concepts of Machine Learning
			CO2	Students will be able to Identify machine learning technique for a given problem of regression techniques.
			CO3	Students will be able to Demonstrate ensemble techniques to combine predictions from different models.
			CO4	Students can able to Identify and Apply classification technique for diverse machine learning applications.
			CO5	Students will be able to Apply various clustering techniques..
			CO6	Student will be able to Apply the dimensionality reduction techniques
	CSC702	**{Bavkar,Pramila) Big Data Analytics**	CO1	Understand the building blocks of Big Data Analytics.
			CO2	Apply fundamental enabling techniques like Hadoop and MapReduce in solving real world problems.

			CO3	Understand different NoSQL systems and how it handles big data.
			CO4	Apply advanced techniques for emerging applications like stream analytics
			CO5	Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications, etc.
			CO6	Apply statistical computing techniques and graphics for analyzing big data
	CSDC 701X	**(Shaveta. Siddharth)** **Department level elective 3[NLP]**	CO1	To define natural language processing and to learn various stages of natural language processing
			CO2	To describe basic concepts and algorithmic description of the main language levels
			CO3	To understand Morphology, Syntax, Semantics, and Pragmatics &Discourse analysis
			CO4	To design and implement various language models and POS tagging techniques.
			CO5	To design and learn NLP applications such as Information Extraction, Question answering.
			CO6	To design and implement applications based on natural language processing.
	CSDC 702X	**(Sakure, Gaurav, Priyanka)** **Block Chain**	CO1	**CO1: Explain blockchain concepts**
			CO2	**CO2: Apply cryptographic hash required for blockchain.**
			CO3	**CO3: Apply the concepts of smart contracts for an application**
			CO4	**CO4: Design a public blockchain using Ethereum.**
			CO5	**CO5:Design a private blockchain using Hyperledger.**

		CO6	**CO6: Use different types of tools for blockchain applications.**
ILO701X	**Institute Level Optional (MIS)** **(Siddharth Harirharan)**	CO1	Explain computer based information systems and their impact on organization and society
		CO2	Explain the usage of tools & techniques for accessing and analyzing information for decision making
		CO3	Explain the security issues in information systems and methods to protect them
		CO4	Understand Internet based businesses like e-commerce and m-commerce
		CO5	Understand wired and wireless networks and the cloud computing model
		CO6	Understand the various Information systems used by organizations and the methodologies adopted for their implementation
ILO701X	**Institute Level Optional (CSL)** **(VBG)**	CO1	Understand the concept of cybercrime and its effect on outside world
		CO2	Interpret and apply IT law in various legal issues
		CO3	Distinguish different aspects of cyber law
		CO4	Apply Information Security Standards compliance during software design and development
		CO5	
		CO6	
CSL701	**(Nilesh, Rohini)** **Machine Learning Lab**	LO1	To implement an appropriate machine learning model for the given application.
		LO2	To implement ensemble techniques to combine predictions from different models.
		LO3	To implement the dimensionality reduction techniques

CSL702	**(Bavkar, Pramila)** **Big Data Analytics Lab**	**LO1**	To interpret business models and scientific computing paradigms, and apply software tools for big data analytics.
		LO2	To implement algorithms that uses Map Reduce to apply on structured and unstructured data
		LO3	To perform hands-on NoSql databases such as Cassandra, HadoopHbase, MongoDB, etc.
		LO4	To implement various data streams algorithms.
		LO5	To analyze the social network graphs using R.
		LO6	To interpret business models and scientific computing paradigms, and apply software tools for big data analytics.
CSDL 701X	**(Shaveta. Siddharth)** **NLP** **Department Level Optional Course-3 Lab**	LO1	Apply various text processing techniques.
		LO2	Design language model for word level analysis.
		LO3	Model linguistic phenomena with formal grammar.
		LO4	Design, implement and analyze NLP algorithms.
		LO5	To apply NLP techniques to design real world NLP applications
		LO6	Implement methodology for training and evaluating empirical NLP systems.
CSDL 702X	(Sakure, Gaurav, Priyanka) Blockchain Department Level Optional Course-4 La	LO1	**LO1: Creating Cryptographic hash using merkle tree.**
		LO2	**LO2: Design Smart Contract using Solidity**
		LO3	**LO3: Implementing ethereum blockchain using Geth.**
		LO4	**LO4: Demonstrate the concept of blockchain in real world application**
CSP701	Major Project 1		

		Randeep, Pramila, Kirti	CO1	To develop the understanding of the problem domain through extensive review of literature.
			CO2	To Identify and analyze the problem in detail to define its scope with problem specific data.
			CO3	To know various techniques to be implemented for the selected problem and related technical skills through feasibility analysis.
			CO4	To design solutions for real-time problems that will positively impact society and environment.
			CO5	To develop clarity of presentation based on communication, teamwork and leadership skills.
			CO6	To inculcate professional and ethical behavior.
SEM-VIII	**CSC801**	**Distributed Computing (DC)**	CO1	Ability to demonstrate knowledge of the basic elements and concepts related to distributed system technologies.
			CO2	Ability to illustrate the middleware technologies that support distributed applications such as RPC, RMI and Object-based middleware
			CO3	Ability to Analyze the various techniques used for clock synchronization, mutual exclusion and deadlock
			CO4	Ability to demonstrate the concepts of Resource and Process management
			CO5	Ability to demonstrate the concepts of Consistency and Replication management and fault Tolerance
			CO6	Apply the knowledge of Distributed File System in building large-scale distributed applications
	CSDC 801X	Department Level Optional Course -5	CO1	1 To gain fundamental knowledge of the data science process
			CO2	To apply data exploration and visualization techniques

	Adavanced Data Science Rohini Patil Dr Seem Biday	CO3	1 To apply anomaly detection techniques.
		CO4	1 To gain an in-depth understanding of time-series forecasting.
		CO5	1 Apply different methodologies and evaluation strategies.
		CO6	To apply data science techniques to real world applications
CSDC 802X	Department Level Optional Course -6 Social Media Analytics D M bavkar	CO1	Understand the concept of Social media
		CO2	Understand the concept of social media Analytics and its significance
		CO3	Learners will be able to analyze the effectiveness of social media
		CO4	Students will be able to use different Social media analytics tools effectively and efficiently.
		CO5	Students will be able to use different effective Visualization techniques to represent social media analytics
		CO6	Acquire the fundamental perspectives and hands-on skills needed to work with social media data
CSL801	Distributed Computing Lab Rohini Patil Pooja Singh	CO1	Apply the Knowledge of different types of operating systems
		CO2	Develop an application using message oriented communication or using RPC /RMI based client-server programs.
		CO3	Implement the suitable clock synchronization and election algorithms to manage the resources.
		CO4	Demonstrate mutual exclusion algorithms and deadlock handling.
		CO5	Implement techniques of resource and process management.
		CO6	Describe the concepts of distributed File Systems with some case studies.
CSDL 801X	Department Level Optional Course -5 Lab ADS lab	LO1	Apply various stages of the data science lifecycle for the selected case study

			LO2	Demonstrate data preparation, exploration and visualization techniques
			LO3	Implement and evaluate different supervised techniques
			LO4	Implement and evaluate different unsupervised techniques.
	CSDL 802X	Department Level Optional Course -6 Lab SMA lab Bavkar Saima Sayyed	LO1	Understand characteristics and types of social media networks
			LO2	Use social media analytics tools for business
			LO3	Collect, monitor , store and track social media data
			LO4	Analyze and visualize social media data from multiple platforms
			LO5	Design and develop content and structure based social media analytics models
			LO6	Design and implement social media analytics applications for business
	CSP801	Major Project 2	CO1	To develop the understanding of the problem domain through extensive review of literature.
			CO2	To Identify and analyze the problem in detail to define its scope with problem specific data.
			CO3	To know various techniques to be implemented for the selected problem and related technical skills through feasibility analysis.
			CO4	To design solutions for real-time problems that will positively impact society and environment.
			CO5	To develop clarity of presentation based on communication, teamwork and leadership skills.
			CO6	To inculcate professional and ethical behavior.

Point

3.1- Resource Mobilization for Research (10)
3.2- Innovation Ecosystem (15)

3.3- Research Publication and Awards (25)

3.4- Extension Activities (40)
3.5 – Collaboration (20)