



**DEPARTMENT OF COMPUTER ENGINEERING**

**Course Outcomes**

Second Year : III SEM (REV- 2019 'C' Scheme)

<b>Course Code:</b>	<b>CSC 301</b>
<b>Course:</b>	<b>Applied Mathematics III</b>
<b>CO-1</b>	Understand the concept of Laplace transform and its application to solve the real integrals in engineering problems.
<b>CO-2</b>	Understand the concept of inverse Laplace transform of various functions and its applications in engineering problems.
<b>CO-3</b>	Expand the periodic function by using the Fourier series for real-life problems and complex engineering problems
<b>CO-4</b>	Understand complex variable theory, application of harmonic conjugate to get orthogonal trajectories and analytic functions.
<b>CO-5</b>	Apply the concept of Correlation and Regression to the engineering problems in data science, machine learning, and AI.
<b>CO-6</b>	Understand the concepts of probability and expectation for getting the spread of the data and distribution of probabilities.

<b>Course Code:</b>	<b>CSC 302</b>
<b>Course:</b>	<b>Discrete Structures and Graph Theory</b>
<b>CO-1</b>	Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving.
<b>CO-2</b>	Ability to reason logically.
<b>CO-3</b>	Ability to understand relations, functions, Diagraph and Lattice.
<b>CO-4</b>	Ability to understand and apply concepts of graph theory in solving real world problems.
<b>CO-5</b>	Understand use of groups and codes in Encoding-Decoding.
<b>CO-6</b>	Analyze a complex computing problem and apply principles of discrete mathematics to identify solutions.

<b>Course Code:</b>	<b>CSC 303</b>
<b>Course:</b>	<b>Data Structures</b>
<b>CO-1</b>	Students will be able to implement Linear and Non-Linear data structures.
<b>CO-2</b>	Students will be able to handle various operations like searching, insertion, deletion and traversals on various data structures.
<b>CO-3</b>	Students will be able to explain various data structures, related terminologies and its types.
<b>CO-4</b>	Students will be able to choose appropriate data structure and apply it to solve problems in various domains.
<b>CO-5</b>	Students will be able to analyze and implement appropriate searching techniques for a given problem.
<b>CO-6</b>	Students will be able to demonstrate the ability to analyze, design, apply and use data structures to solve engineering problems and evaluate their solutions.



<b>Course Code:</b>	CSC 304
<b>Course:</b>	Digital Logic and Computer Architecture
<b>CO-1</b>	To illustrate different number systems and basic structure of computer systems.
<b>CO-2</b>	To demonstrate the arithmetic algorithms.
<b>CO-3</b>	To articulate the basic concepts of digital components and processor organization.
<b>CO-4</b>	To indicate the generation of control signals of computers.
<b>CO-5</b>	To demonstrate the memory organization.
<b>CO-6</b>	To describe the concepts of parallel processing and different Buses.

<b>Course Code:</b>	CSC 305
<b>Course:</b>	Computer Graphics
<b>CO-1</b>	Describe the basic concepts of Computer Graphics.
<b>CO-2</b>	Demonstrate various algorithms for basic graphics primitives.
<b>CO-3</b>	Apply 2-D geometric transformations on graphical objects.
<b>CO-4</b>	Use various Clipping algorithms on graphical objects
<b>CO-5</b>	Explore 3-D geometric transformations, curve representation techniques and projections methods.
<b>CO-6</b>	Explain visible surface detection techniques and Animation.

<b>Course Code:</b>	CSL 301
<b>Course:</b>	Data Structures Lab
<b>CO-1</b>	Students will be able to implement various linear and nonlinear data structures.
<b>CO-2</b>	Students will be able to handle operations like insertion, deletion, searching and traversing on various data structures.

<b>Course Code:</b>	CSL 302
<b>Course:</b>	Digital Logic and Computer Architecture Lab
<b>CO-1</b>	To discern the basics of digital components
<b>CO-2</b>	Design the basic building blocks of a computer: ALU, registers, CPU and memory
<b>CO-3</b>	To recognize the importance of digital systems in computer architecture
<b>CO-4</b>	To implement various algorithms for arithmetic operations.



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<b>Course Code:</b>	CSL 303
<b>Course:</b>	Computer Graphics Lab
<b>CO-1</b>	Implement various output and filled area primitive algorithms
<b>CO-2</b>	Apply transformation, projection and clipping algorithms on graphical objects.
<b>CO-3</b>	Implementation of curve and fractal generation.
<b>CO-4</b>	Develop a Graphical application/Animation based on learned concept

<b>Course Code:</b>	CSL 304
<b>Course:</b>	Skill Lab : Object Oriented Programming Methodology
<b>CO-1</b>	To apply fundamental programming constructs.
<b>CO-2</b>	To illustrate the concept of packages, classes and objects.
<b>CO-3</b>	To elaborate the concept of strings, arrays and vectors.
<b>CO-4</b>	To implement the concept of inheritance and interfaces.
<b>CO-5</b>	To implement the concept of exception handling and multithreading.
<b>CO-6</b>	To develop GUI based application

<b>Course Code:</b>	CSM 301
<b>Course:</b>	Mini Project -I A
<b>CO-1</b>	Identify problems based on societal /research needs.
<b>CO-2</b>	Apply Knowledge and skill to solve societal problems in a group.
<b>CO-3</b>	Develop interpersonal skills to work as member of a group or leader
<b>CO-4</b>	Draw the proper inferences from available results through theoretical/ experimental/simulations.
<b>CO-5</b>	Analyze the impact of solutions in societal and environmental context for sustainable development.
<b>CO-6</b>	Use standard norms of engineering practices
<b>CO-7</b>	Excel in written and oral communication.
<b>CO-8</b>	Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.
<b>CO-9</b>	Demonstrate project management principles during project work.

Second Year : IV SEM (REV- 2019 'C' Scheme)

<b>Course Code:</b>	CSC 401
<b>Course:</b>	Engineering Mathematics – IV
<b>CO-1</b>	Apply the concepts of eigen values and eigen vectors in engineering problems.
<b>CO-2</b>	Use the concepts of Complex Integration for evaluating integrals, computing residues & evaluate various contour integrals.
<b>CO-3</b>	Apply the concept of Z- transformation and its inverse in engineering problems.
<b>CO-4</b>	Use the concept of probability distribution and sampling theory to engineering problems.
<b>CO-5</b>	Apply the concept of Linear Programming Problems of optimization
<b>CO-6</b>	Solve Non-Linear Programming Problems for optimization of engineering problems

<b>Course Code:</b>	CSC 402
<b>Course:</b>	Analysis of Algorithms
<b>CO-1</b>	Analyze the running time and space complexity of algorithms .
<b>CO-2</b>	Describe, apply and analyze the complexity of divide and conquer strategy.
<b>CO-3</b>	Describe, apply and analyze the complexity of greedy strategy.
<b>CO-4</b>	Describe, apply and analyze the complexity of dynamic programming strategy
<b>CO-5</b>	Explain and apply backtracking, branch and bound.
<b>CO-6</b>	Explain and apply string matching technique.

<b>Course Code:</b>	CSC 403
<b>Course:</b>	Database Management Systems
<b>CO-1</b>	Students should be able to explain the fundamentals of a database system.
<b>CO-2</b>	Students should be able to design and draw ER and EER diagram for the real life problem.
<b>CO-3</b>	Students should be able to convert conceptual model to relational model and formulate relational algebra queries.
<b>CO-4</b>	Students should be able to design and querying database using SQL.
<b>CO-5</b>	Students should be able to analyze and apply concepts of normalization to relational database design.
<b>CO-6</b>	Students should be able to describe the concept of transaction, concurrency and recovery.



<b>Course Code:</b>	CSC 404
<b>Course:</b>	Operating Systems
<b>CO-1</b>	Understand the objectives, functions and structure of OS.
<b>CO-2</b>	Analyze the concept of process management and evaluate performance of process scheduling algorithms.
<b>CO-3</b>	Understand and apply the concepts of synchronization and deadlocks
<b>CO-4</b>	Evaluate performance of Memory allocation and replacement policies
<b>CO-5</b>	Understand the concepts of file management.
<b>CO-6</b>	Apply concepts of I/O management and analyze techniques of disk scheduling.

<b>Course Code:</b>	CSC 405
<b>Course:</b>	Microprocessor
<b>CO-1</b>	Describe core concepts of 8086 microprocessor
<b>CO-2</b>	Interpret the instructions of 8086 and write assembly and mixed language programs
<b>CO-3</b>	Identify the specifications of peripheral chip
<b>CO-4</b>	Design 8086 based system using memory and peripheral chips
<b>CO-5</b>	Appraise the architecture of advanced processors
<b>CO-6</b>	Understanding hyperthreading technology

<b>Course Code:</b>	CSL 401
<b>Course:</b>	Analysis of Algorithms Lab
<b>CO-1</b>	To introduce the methods of designing and analyzing algorithms
<b>CO-2</b>	Design and implement efficient algorithms for a specified application
<b>CO-3</b>	Strengthen the ability to identify and apply the suitable algorithm for the given real-world problem.
<b>CO-4</b>	Analyze worst-case running time of algorithms and understand fundamental algorithmic problems

<b>Course Code:</b>	CSL 402
<b>Course:</b>	Database Management Systems Lab
<b>CO-1</b>	Design ER /EER diagram and convert to relational model for the realworld application. 2
<b>CO-2</b>	Apply DDL, DML, DCL and TCL commands 3
<b>CO-3</b>	Write simple and complex queries 4
<b>CO-4</b>	Use PL / SQL Constructs



<b>Course Code:</b>	CSL 403
<b>Course:</b>	Operating System Lab
<b>CO-1</b>	To gain practical experience with designing and implementing concepts of operating systems such as system calls, CPU scheduling, process management, memory management, file systems and deadlock handling using C language in Linux environment.
<b>CO-2</b>	To familiarize students with the architecture of Linux OS.
<b>CO-3</b>	To provide necessary skills for developing and debugging programs in Linux environment
<b>CO-4</b>	To learn programmatically to implement simple operation system mechanisms

<b>Course Code:</b>	CSL 404
<b>Course:</b>	Microprocessor Lab
<b>CO-1</b>	Use appropriate instructions to program microprocessor to perform various tasks
<b>CO-2</b>	Develop the program in assembly language for intel 8086 processor
<b>CO-3</b>	Demonstrate the execution and debugging of assembly and mixed language program

<b>Course Code:</b>	CSL 405
<b>Course:</b>	Skill Lab : Python Programming
<b>CO-1</b>	To understand basic concepts in python.
<b>CO-2</b>	To explore contents of files, directories and text processing with python
<b>CO-3</b>	To develop program for data structure using built in functions in python.
<b>CO-4</b>	To explore django web framework for developing python-based web application.
<b>CO-5</b>	To understand Multithreading concepts using python.
<b>CO-6</b>	To explore numpy and pandas libraries

<b>Course Code:</b>	CSM 401
<b>Course:</b>	Mini Project I – B
<b>CO-1</b>	Identify problems based on societal /research needs.
<b>CO-2</b>	Apply Knowledge and skill to solve societal problems in a group.
<b>CO-3</b>	Develop interpersonal skills to work as member of a group or leader
<b>CO-4</b>	Draw the proper inferences from available results through theoretical/ experimental/simulations.
<b>CO-5</b>	Analyze the impact of solutions in societal and environmental context for sustainable development.
<b>CO-6</b>	Use standard norms of engineering practices
<b>CO-7</b>	Excel in written and oral communication.
<b>CO-8</b>	Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.
<b>CO-9</b>	Demonstrate project management principles during project work.

## Department of Computer Engineering

Third Year : V SEM (REV- 2019 'C' Scheme)

<b>Course Code:</b>	CSC 501
<b>Course:</b>	Theoretical Computer Science
<b>CO-1</b>	Identify the central concepts in theory of computation and differentiate between deterministic and nondeterministic automata, also obtain equivalence of nfa and dfa.
<b>CO-2</b>	Infer the equivalence of languages described by finite automata and regular expressions.
<b>CO-3</b>	Devise regular, context free grammars while recognizing the strings and tokens
<b>CO-4</b>	Design pushdown automata to recognize the language and develop an understanding of computation through machine
<b>CO-5</b>	Design of computational systems through Turing Machine
<b>CO-6</b>	Describe the concepts of decidability and undecidability.

<b>Course Code:</b>	CSC 502
<b>Course:</b>	Software Engineering
<b>CO-1</b>	Identify requirements, analyze and prepare models
<b>CO-2</b>	Plan, schedule and track the progress of the projects
<b>CO-3</b>	Design the software projects
<b>CO-4</b>	Do testing of software project.
<b>CO-5</b>	Identify risks, manage the change to assure quality in software projects.

<b>Course Code:</b>	CSC 503
<b>Course:</b>	Computer Network
<b>CO-1</b>	Demonstrate the concepts of computer networks and compare OSI-ISO model with TCP-IP model.
<b>CO-2</b>	Understand the concepts of data communication at physical Layer
<b>CO-3</b>	Explore different design issues at data link layer.
<b>CO-4</b>	Design the network using ip addressing and subnetting / supernetting schemes and analyze various routing protocols.
<b>CO-5</b>	Analyze transport layer protocols and congestion control algorithms.
<b>CO-6</b>	Explore different protocols at application layer

<b>Course Code:</b>	CSC 504
<b>Course:</b>	Data Warehouse and Mining
<b>CO-1</b>	Understand data warehouse fundamentals and design data warehouse with dimensional modelling and apply OLAP operations.



<b>CO-2</b>	Understand data mining principles and perform Data preprocessing and Visualization
<b>CO-3</b>	Identify appropriate data mining algorithms to solve real world problems.
<b>CO-4</b>	Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining
<b>CO-5</b>	Describe complex information and social networks with respect to web mining.

<b>Course Code:</b>	CSDLO5011
<b>Course:</b>	Probabilistic Graphical Model
<b>CO-1</b>	understand basic concepts of probabilistic graphical modelling.
<b>CO-2</b>	model and extract inference from various graphical models like Bayesian Networks, Markov Models.
<b>CO-3</b>	perform learning and take actions and decisions using probabilistic graphical models.
<b>CO-4</b>	represent real world problems using graphical models; design inference algorithms; and learn the structure of the graphical model from data.
<b>CO-5</b>	design real life applications using probabilistic graphical models.

<b>Course Code:</b>	CSDLO5012
<b>Course:</b>	Internet Programming
<b>CO-1</b>	Implement interactive web page(s) using HTML and CSS.
<b>CO-2</b>	Design a responsive web site using JavaScript
<b>CO-3</b>	Demonstrate database connectivity using JDBC.
<b>CO-4</b>	Demonstrate Rich Internet Application using Ajax.
<b>CO-5</b>	Demonstrate and differentiate various Web Extensions.
<b>CO-6</b>	Demonstrate web application using Reactive Js.

<b>Course Code:</b>	CSDLO5013
<b>Course:</b>	Advanced Database Management Systems
<b>CO-1</b>	Design distributed database using the various techniques for query processing .
<b>CO-2</b>	Measure query cost and perform distributed transaction management
<b>CO-3</b>	Organize the data using XML and JSON database for better interoperability
<b>CO-4</b>	Compare different types of NoSQL databases
<b>CO-5</b>	Formulate NoSQL queries using Mongodb
<b>CO-6</b>	Describe various trends in advance databases through temporal, graph based and spatial based databases





<b>Course Code:</b>	CSL 501
<b>Course:</b>	Software Engineering Lab
<b>CO-1</b>	Identify requirements and apply software process model to selected case study.
<b>CO-2</b>	Develop architectural models for the selected case study.
<b>CO-3</b>	Use computer-aided software engineering (CASE) tools.
<b>CO-4</b>	Identify requirements and apply software process model to selected case study.
<b>CO-5</b>	Develop architectural models for the selected case study.
<b>CO-6</b>	Use computer-aided software engineering (CASE) tools.

<b>Course Code:</b>	CSL 502
<b>Course:</b>	Computer Network Lab
<b>CO-1</b>	Design and setup networking environment in Linux.
<b>CO-2</b>	Use Network tools and simulators such as NS2, Wireshark etc. to explore networking algorithms and protocols.
<b>CO-3</b>	Implement programs using core programming APIs for understanding networking concepts.

<b>Course Code:</b>	CSL 503
<b>Course:</b>	Data Warehouse and Mining Lab
<b>CO-1</b>	Design data warehouse and perform various OLAP operations.
<b>CO-2</b>	Implement data mining algorithms like classification.
<b>CO-3</b>	Implement clustering algorithms on a given set of data sample.
<b>CO-4</b>	Implement Association rule mining & web mining algorithm.

<b>Course Code:</b>	CSL 504
<b>Course:</b>	Business and Communication Ethics
<b>CO-1</b>	Plan and prepare effective business/ technical documents which will in turn provide solid foundation for their future managerial roles.
<b>CO-2</b>	Strategize their personal and professional skills to build a professional image and meet the demands of the industry.
<b>CO-3</b>	Emerge successful in group discussions, meetings and result-oriented agreeable solutions in group communication situations.
<b>CO-4</b>	Deliver persuasive and professional presentations.
<b>CO-5</b>	Develop creative thinking and interpersonal skills required for effective professional communication.
<b>CO-6</b>	Apply codes of ethical conduct, personal integrity and norms of organizational behaviour.



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<b>Course Code:</b>	CSM 501
<b>Course:</b>	MiniProject – 2 A
<b>CO-1</b>	Identify Methodology for solving above problem and apply engineering knowledge and skills to solve it
<b>CO-2</b>	Validate, Verify the results using test cases/benchmark data/theoretical/inferences/experiments/simulations
<b>CO-3</b>	Analyze and evaluate the impact of solution/product/research/innovation /entrepreneurship towards societal/environmental/sustainable development
<b>CO-4</b>	Use standard norms of engineering practices and project management principles during project work.
<b>CO-5</b>	Communicate through technical report writing and oral presentation. <ul style="list-style-type: none"><li>• The work may result in research/white paper/ article/blog writing and publication</li><li>• The work may result in business plan for entrepreneurship product created</li><li>• The work may result in patent filing.</li></ul>
<b>CO-6</b>	Gain technical competency towards participation in Competitions, Hackathons, etc.
<b>CO-7</b>	Demonstrate capabilities of self-learning, leading to lifelong learning.
<b>CO-8</b>	Develop interpersonal skills to work as a member of a group or as leaders.
<b>CO-9</b>	Identify Methodology for solving above problem and apply engineering knowledge and skills to solve it

Third Year : VI SEM (REV- 2019 'C' Scheme)

<b>Course Code:</b>	CSC 601
<b>Course:</b>	System Programming and Compiler Construction
<b>CO-1</b>	To understand the role and functionality of various system programs over application programs
<b>CO-2</b>	To understand basic concepts, structure and design of assemblers, macro processors, linkers and loaders.
<b>CO-3</b>	To understand the basic principles of compiler design, its various constituent parts, algorithms and data structures required to be used in the compiler.
<b>CO-4</b>	To understand the need to follow the syntax in writing an application program and to learn how the analysis phase of compiler is designed to understand the programmer 's requirements without ambiguity
<b>CO-5</b>	To synthesize the analysis phase outcomes to produce the object code that is efficient in terms of space and execution time

<b>Course Code:</b>	CSC 602
<b>Course:</b>	Cryptography and System Security
<b>CO-1</b>	Students should be able to explain system security goals and concepts, classical encryption techniques and acquire fundamental knowledge on the concepts of modular arithmetic and number theory.
<b>CO-2</b>	Students should be able to compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication.
<b>CO-3</b>	Students should be able to apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
<b>CO-4</b>	Students should be able to apply different digital signature algorithms to achieve authentication and design secure applications.
<b>CO-5</b>	Students should be able to explain network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like ssl, ipsec, and pgp.
<b>CO-6</b>	Students should be able to analyze and apply system security concepts to recognize malicious code.

<b>Course Code:</b>	CSC 603
<b>Course:</b>	Mobile Computing
<b>CO-1</b>	To identify basic concepts and principles in mobile communication & computing, cellular architecture.
<b>CO-2</b>	To describe the components and functioning of mobile networking.



CO-3	To classify variety of security techniques in mobile network
CO-4	To apply the concepts of WLAN for local as well as remote applications
CO-5	To describe and apply the concepts of mobility management
CO-6	To describe Long Term Evolution (LTE) architecture and its interfaces

<b>Course Code:</b>	CSC 604
<b>Course:</b>	Artificial Intelligence
CO-1	Ability to develop a basic understanding of AI building blocks presented in intelligent agents.
CO-2	Ability to choose an appropriate problem solving method and knowledge representation technique.
CO-3	Ability to analyze the strength and weaknesses of AI approaches to knowledge-intensive problem solving.
CO-4	Ability to design models for reasoning with uncertainty as well as the use of unreliable information.
CO-5	Ability to design planning and learning for problem definitions
CO-6	Ability to design and develop AI applications in real world scenarios.

<b>Course Code:</b>	CSDLO6011
<b>Course:</b>	Internet of Things
CO-1	Understand the concepts of IoT and the Things in IoT
CO-2	Understand concept of Smart Object, Sensor network and enabling IOT technologies
CO-3	Emphasize core IoT functional Stack
CO-4	Emphasize on Application Protocols for IOT
CO-5	Apply IoT knowledge to key industries that IoT is revolutionizing
CO-6	Examines various IoT hardware items and software platforms used in projects

<b>Course Code:</b>	CSDLO6012
<b>Course:</b>	Digital Signal and Image Processing
CO-1	Students learn DT signal and apply system for solving problem.
CO-2	Students classify and analyze various types of DT system and solve problem
CO-3	Students implement algorithm, of DFT and FFT and solve problems.
CO-4	Students use the enhancement techniques of DSP.
CO-5	Students differentiate advantages and disadvantage of edge detection techniques
CO-6	Develop Small projects of 1 D and 2 D digital signal processing.

<b>Course Code:</b>	CSDLO6013
<b>Course:</b>	Quantitative Analysis
<b>CO-1</b>	Recognize the need of Statistics and Quantitative Analysis.
<b>CO-2</b>	Apply the data collection and the sampling methods.
<b>CO-3</b>	Analyze using concepts of Regression, Multiple Linear Regression
<b>CO-4</b>	Formulate Statistical inference drawing methods
<b>CO-5</b>	Apply Testing of hypotheses

<b>Course Code:</b>	CSL 601
<b>Course:</b>	System Programming and Compiler Construction Lab
<b>CO-1</b>	Generate machine code by implementing two pass assemblers.
<b>CO-2</b>	Implement Two pass macro processor.
<b>CO-3</b>	Parse the given input string by constructing Top down/Bottom-up parser.
<b>CO-4</b>	Identify and Validate tokens for given high level language and Implement synthesis phase of compiler.
<b>CO-5</b>	Explore LEX & YACC tools.

<b>Course Code:</b>	CSL 602
<b>Course:</b>	Cryptography and System Security Lab
<b>CO-1</b>	apply the knowledge of symmetric and asymmetric cryptography to implement simple ciphers.
<b>CO-2</b>	explore the different network reconnaissance tools to gather information about networks.
<b>CO-3</b>	explore and use tools like sniffers, port scanners and other related tools for analysing packets in a Network.
<b>CO-4</b>	set up firewalls and intrusion detection systems using open-source technologies and to explore email security.
<b>CO-5</b>	explore various attacks like buffer-overflow and web application attack.

<b>Course Code:</b>	CSL 603
<b>Course:</b>	Mobile Computing Lab
<b>CO-1</b>	Develop and demonstrate mobile applications using various tools
<b>CO-2</b>	Articulate the knowledge of GSM, CDMA & Bluetooth technologies and demonstrate it.
<b>CO-3</b>	Students will able to carry out simulation of frequency reuse, hidden/exposed terminal problem.
<b>CO-4</b>	Implement security algorithms for mobile communication network
<b>CO-5</b>	Demonstrate simulation and compare the performance of Wireless LAN

<b>Course Code:</b>	CSL 604
<b>Course:</b>	Artificial Intelligence Lab
<b>CO-1</b>	Identify languages and technologies for Artificial Intelligence.
<b>CO-2</b>	Understand and implement uninformed and informed searching techniques for real world problems.
<b>CO-3</b>	Create a knowledge base using any AI language.
<b>CO-4</b>	Design and implement expert systems for real world problems

<b>Course Code:</b>	CSL 605
<b>Course:</b>	Cloud Computing Lab
<b>CO-1</b>	Implement different types of virtualization techniques.
<b>CO-2</b>	Analyze various cloud computing service models and implement them to solve the given problems.
<b>CO-3</b>	Design and develop real world web applications and deploy them on commercial cloud(s).
<b>CO-4</b>	Explain major security issues in the cloud and mechanisms to address them.
<b>CO-5</b>	Explore various commercially available cloud services and recommend the appropriate one for the given application.
<b>CO-6</b>	Implement the concept of containerization



<b>Course Code:</b>	CSM 601
<b>Course:</b>	Mini Project – 2B
<b>CO-1</b>	Identify societal/research/innovation/entrepreneurship problems through appropriate literature surveys
<b>CO-2</b>	Identify Methodology for solving above problem and apply engineering knowledge and skills to solve it
<b>CO-3</b>	Validate, Verify the results using test cases/benchmark data/theoretical/inferences/experiments/simulations
<b>CO-4</b>	Analyze and evaluate the impact of solution/product/research/innovation /entrepreneurship towards societal/environmental/sustainable development
<b>CO-5</b>	Use standard norms of engineering practices and project management principles during project work
<b>CO-6</b>	Communicate through technical report writing and oral presentation. <ul style="list-style-type: none"><li>• The work may result in research/white paper/ article/blog writing and publication</li><li>• The work may result in business plan for entrepreneurship product created</li><li>• The work may result in patent filing.</li></ul>
<b>CO-7</b>	Gain technical competency towards participation in Competitions, Hackathons, etc.
<b>CO-8</b>	Demonstrate capabilities of self-learning, leading to lifelong learning.
<b>CO-9</b>	Develop interpersonal skills to work as a member of a group or as leader

Final Year : VII SEM (REV- 2019 'C' Scheme)

<b>Course Code:</b>	CSC 701
<b>Course:</b>	Machine Learning
<b>CO-1</b>	To acquire fundamental knowledge of developing machine learning models.
<b>CO-2</b>	To select, apply and evaluate an appropriate machine learning model for the given scenario
<b>CO-3</b>	To demonstrate ensemble techniques to combine predictions from different models.
<b>CO-4</b>	To demonstrate the dimensionality reduction technique.
<b>CO-5</b>	Design application using machine learning techniques

<b>Course Code:</b>	CSC 702
<b>Course:</b>	Big Data Analytics
<b>CO-1</b>	Understand the building blocks of Big Data Analytics.
<b>CO-2</b>	Apply fundamental enabling techniques like Hadoop and MapReduce in solving real world problems.
<b>CO-3</b>	Understand different NoSQL systems and how it handles big data.
<b>CO-4</b>	Apply advanced techniques for emerging applications like stream analytics.
<b>CO-5</b>	Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications, etc.
<b>CO-6</b>	Apply statistical computing techniques and graphics for analyzing big data.

<b>Course Code:</b>	CSDC7011
<b>Course:</b>	Machine Vision
<b>CO-1</b>	Elaborate the components of Machine Vision Application.
<b>CO-2</b>	Perform image, video preprocessing operations
<b>CO-3</b>	Explain various transformations, interpolation.
<b>CO-4</b>	Elaborate motion tracking in video.
<b>CO-5</b>	Analyze and Implement appropriate filtering techniques for a given problem.
<b>CO-6</b>	Develop applications based on machine vision



<b>Course Code:</b>	CSDC7013
<b>Course:</b>	Natural Language Processing
<b>CO-1</b>	To describe the field of natural language processing.
<b>CO-2</b>	To design language model for word level analysis for text processing.
<b>CO-3</b>	To design various POS tagging techniques and parsers.
<b>CO-4</b>	To design, implement and test algorithms for semantic and pragmatic analysis.
<b>CO-5</b>	To formulate the discourse segmentation and anaphora resolution.
<b>CO-6</b>	To apply NLP techniques to design real world NLP applications.

<b>Course Code:</b>	CSDC7022
<b>Course:</b>	Blockchain
<b>CO-1</b>	Explain blockchain concepts
<b>CO-2</b>	Apply cryptographic hash required for blockchain.
<b>CO-3</b>	Apply the concepts of smart contracts for an application.
<b>CO-4</b>	Design a public blockchain using Ethereum.
<b>CO-5</b>	Design a private blockchain using Hyperledger.
<b>CO-6</b>	Use different types of tools for blockchain applications.

<b>Course Code:</b>	CSDC7023
<b>Course:</b>	Information Retrieval
<b>CO-1</b>	Define and describe the basic concepts of the Information retrieval system
<b>CO-2</b>	Design the various modeling techniques for information retrieval systems.
<b>CO-3</b>	Understand the query structure and various query operations
<b>CO-4</b>	Analyzing the indexing and scoring operation in information retrieval systems
<b>CO-5</b>	Perform the evaluation of information retrieval systems
<b>CO-6</b>	Analyze various information retrieval for real world application

<b>Course Code:</b>	ILO7013
<b>Course:</b>	Management Information System
<b>CO-1</b>	Explain how information systems Transform Business
<b>CO-2</b>	Identify the impact information systems have on an organization



CO-3	Describe IT infrastructure and its components and its current trends
CO-4	Understand the principal tools and technologies for accessing information from databases to improve business performance and decision making
CO-5	Identify the types of systems used for enterprise-wide knowledge management and how they provide value for businesses

<b>Course Code:</b>	ILO 7016
<b>Course:</b>	Cyber Security and Laws
CO-1	Understand the concept of cybercrime and its effect on outside world
CO-2	Interpret and apply IT law in various legal issues
CO-3	Distinguish different aspects of cyber law
CO-4	Apply Information Security Standards compliance during software design and development

<b>Course Code:</b>	ILO 7017
<b>Course:</b>	Disaster Management and Mitigation Measures
CO-1	Get to know natural as well as manmade disaster and their extent and possible effects on the economy.
CO-2	Plan of national importance structures based upon the previous history.
CO-3	Get acquainted with government policies, acts and various organizational structure associated with an emergency.
CO-4	Get to know the simple do's and don'ts in such extreme events and act accordingly.

<b>Course Code:</b>	CSL701
<b>Course:</b>	Machine Learning Lab
CO-1	To implement an appropriate machine learning model for the given application.
CO-2	To implement ensemble techniques to combine predictions from different models.
CO-3	To implement the dimensionality reduction techniques.

<b>Course Code:</b>	CSL 702
<b>Course:</b>	Big Data Analytics Lab
CO-1	To interpret business models and scientific computing paradigms, and apply software tools for big data analytics
CO-2	To implement algorithms that uses Map Reduce to apply on structured and unstructured data
CO-3	To perform hands-on NoSql databases such as Cassandra, HadoopHbase, MongoDB, etc.
CO-4	To implement various data streams algorithms.



<b>CO-5</b>	To develop and analyze the social network graphs with data visualization techniques.
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<b>Course Code:</b>	CSDL7011
<b>Course:</b>	Machine Vision Lab
<b>CO-1</b>	Students will be able to read image and video file, perform different Processing.
<b>CO-2</b>	Students will be able to do edge detection ,depth estimation
<b>CO-3</b>	Students will be able to choose appropriate algo for segmentation
<b>CO-4</b>	Students will be able to implement object detection technique

<b>Course Code:</b>	CSDL7013
<b>Course:</b>	Natural Language Processing Lab
<b>CO-1</b>	Apply various text processing techniques.
<b>CO-2</b>	Design language model for word level analysis.
<b>CO-3</b>	Model linguistic phenomena with formal grammar.
<b>CO-4</b>	Design, implement and analyze NLP algorithms.
<b>CO-5</b>	To apply NLP techniques to design real world NLP applications such as machine translation, sentiment analysis, text summarization, information extraction, Question Answering system etc.
<b>CO-6</b>	Implement proper experimental methodology for training and evaluating empirical NLP systems.

<b>Course Code:</b>	CSDL7022
<b>Course:</b>	Blockchain Lab
<b>CO-1</b>	Creating Cryptographic hash using merkle tree
<b>CO-2</b>	Design Smart Contract using Solidity.
<b>CO-3</b>	Implementing ethereum blockchain using Geth.
<b>CO-4</b>	Demonstrate the concept of blockchain in real world application.

<b>Course Code:</b>	CSDL7023
<b>Course:</b>	Information Retrieval Lab
<b>CO-1</b>	To frame queries for information retrieval
<b>CO-2</b>	To implement modeling techniques
<b>CO-3</b>	To perform query expansion techniques 4
<b>CO-4</b>	To demonstrate evaluation techniques for IR



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<b>Course Code:</b>	CSP 701
<b>Course:</b>	Major Project – I
<b>CO-1</b>	To develop the understanding of the problem domain through extensive review of literature.
<b>CO-2</b>	To Identify and analyze the problem in detail to define its scope with problem specific data.
<b>CO-3</b>	To know various techniques to be implemented for the selected problem and related technical skills through feasibility analysis.
<b>CO-4</b>	To design solutions for real-time problems that will positively impact society and environment.
<b>CO-5</b>	To develop clarity of presentation based on communication, teamwork and leadership skills.
<b>CO-6</b>	To inculcate professional and ethical behavior.

Final Year: VIII SEM (REV- 2019 'C' Scheme)

<b>Course Code:</b>	CSC 801
<b>Course:</b>	Distributed Computing
<b>CO-1</b>	Demonstrate the knowledge of basic elements and concepts related to distributed system technologies.
<b>CO-2</b>	Illustrate the middleware technologies that support distributed applications such as RPC, RMI and Object-based middleware.
<b>CO-3</b>	Analyze the various techniques used for clock synchronization, mutual exclusion and deadlock.
<b>CO-4</b>	Demonstrate the concepts of Resource and Process management.
<b>CO-5</b>	Demonstrate the concepts of Consistency, Replication Management and fault Tolerance.
<b>CO-6</b>	Apply the knowledge of Distributed File systems in building large-scale distributed applications.

<b>Course Code:</b>	CSDC8011
<b>Course:</b>	Deep Learning
<b>CO-1</b>	Gain basic knowledge of Neural Networks.
<b>CO-2</b>	Acquire in depth understanding of training Deep Neural Networks.
<b>CO-3</b>	Design appropriate DNN model for supervised, unsupervised and sequence learning applications.
<b>CO-4</b>	Gain familiarity with recent trends and applications of Deep Learning.

<b>Course Code:</b>	CSDC8012
<b>Course:</b>	Digital Forensics
<b>CO-1</b>	Discuss the phases of Digital Forensics and methodology to handle the computer security incident.
<b>CO-2</b>	Describe the process of collection, analysis and recovery of the digital evidence.
<b>CO-3</b>	Explore various tools to analyze malwares and acquired images of RAM/hard drive.
<b>CO-4</b>	Acquire adequate perspectives of digital forensic investigation in mobile devices
<b>CO-5</b>	Analyze the source and content authentication of emails and browsers.
<b>CO-6</b>	Produce unambiguous investigation reports which offer valid conclusions

<b>Course Code:</b>	CSDC8013
<b>Course:</b>	Applied Data Science
<b>CO-1</b>	To gain fundamental knowledge of the data science process.
<b>CO-2</b>	To apply data exploration and visualization techniques.
<b>CO-3</b>	To apply anomaly detection techniques.
<b>CO-4</b>	To gain an in-depth understanding of time-series forecasting.
<b>CO-5</b>	Apply different methodologies and evaluation strategies.
<b>CO-6</b>	To apply data science techniques to real world applications

<b>Course Code:</b>	ILO8021
<b>Course:</b>	Project Management
<b>CO-1</b>	Apply selection criteria and select an appropriate project from different options
<b>CO-2</b>	Write work break down structure for a project and develop a schedule based on it.
<b>CO-3</b>	Identify opportunities and threats to the project and decide an approach to deal with them strategically.
<b>CO-4</b>	Use Earned value technique and determine & predict status of the project.
<b>CO-5</b>	Capture lessons learned during project phases and document them for future reference

<b>Course Code:</b>	ILO8022
<b>Course:</b>	Finance Management
<b>CO-1</b>	Students should be able to explain the importance and components of the Indian Financial System.
<b>CO-2</b>	Students should be able to estimate the risk & returns and present / future value of ofvarious investments
<b>CO-3</b>	Students should be able to describe corporate finance and significance of financial statements & ratio analysis
<b>CO-4</b>	Students should be able to calculate capital budgeting using various investment appraisal criterias & also the working capital requirements
<b>CO-5</b>	Students should be able to explain the various sources of finance and capital structuretheories & approaches
<b>CO-6</b>	Students should be able to describe the dividend policy theories & approaches



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<b>Course Code:</b>	ILO8029
<b>Course:</b>	Environmental Management
<b>CO-1</b>	Students should be able to Identify environmental Issues relevant to India and Global concerns
<b>CO-2</b>	Students should be able to understand and apply the concept of Environment Management and Sustainable development.
<b>CO-3</b>	Students should be able to relate to the scope of Environment Management and identify career opportunities.
<b>CO-4</b>	Students should be able to understand the concept of ecology, Ecosystem, its interdependence and food chain.
<b>CO-5</b>	Students should be able to demonstrate awareness of environment related legislations.
<b>CO-6</b>	Students should be able to develop awareness of EMS and ISO-14000.

<b>Course Code:</b>	CSL 801
<b>Course:</b>	Distributed Computing Lab
<b>CO-1</b>	Develop test and debug using Message-Oriented Communication or RPC/RMI based client-server programs.
<b>CO-2</b>	Implement techniques for clock synchronization
<b>CO-3</b>	Implement techniques for Election Algorithms.
<b>CO-4</b>	Demonstrate mutual exclusion algorithms and deadlock handling.
<b>CO-5</b>	Implement techniques of resource and process management.
<b>CO-6</b>	Describe the concepts of distributed File Systems with some case studies.

<b>Course Code:</b>	CSDL8021
<b>Course:</b>	Deep Learning Lab
<b>CO-1</b>	Implement basic neural network models to learn logic functions.
<b>CO-2</b>	Design and train feedforward neural networks using various learning algorithms.
<b>CO-3</b>	Build and train deep learning models such as Autoencoders, CNNs, RNN, LSTM etc.



<b>Course Code:</b>	CSDL8022
<b>Course:</b>	Digital Forensics Lab
<b>CO-1</b>	Explore various forensics tools and use them to acquire, duplicate and analyze data and recover deleted data.
<b>CO-2</b>	Implement penetration testing using forensics tools.
<b>CO-3</b>	Explore various forensics tools and use them to acquire and analyze live and static data.
<b>CO-4</b>	Verification of source and content authentication of emails and browsers.
<b>CO-5</b>	Demonstrate Timeline Report Analysis using forensics tools.
<b>CO-6</b>	Discuss real time crime forensics investigations scenarios.

<b>Course Code:</b>	CSDL8023
<b>Course:</b>	Applied Data Science Lab
<b>CO-1</b>	Apply various stages of the data science lifecycle for the selected case study.
<b>CO-2</b>	Demonstrate data preparation, exploration and visualization techniques.
<b>CO-3</b>	Implement and evaluate different supervised and unsupervised techniques.

<b>Course Code:</b>	CSP801
<b>Course:</b>	Major Project
<b>CO-1</b>	Implement solutions for the selected problem by applying technical and professional skills.
<b>CO-2</b>	Analyze impact of solutions in societal and environmental context for sustainable development.
<b>CO-3</b>	Collaborate best practices along with effective use of modern tools
<b>CO-4</b>	Develop proficiency in oral and written communication with effective leadership and teamwork.
<b>CO-5</b>	Nurture professional and ethical behavior.
<b>CO-6</b>	Gain expertise that helps in building lifelong learning experience.