SIES Graduate School of Technology

RISE WITH EDUCATION

DEPARTMENT OF ARTIFICIAL INTELINGE AND DATA SCIENCE

Course Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Course Code:	CSL 403
Course:	Operating System Lab
CO-1	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.
CO-2	To familiarize students with the architecture of Linux OS .
CO-3	To provide necessary skills for developing and debugging programs in Linux environment
CO-4	To learn programmatically to implement simple operation system mechanisms

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

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

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

Course Code:	CSC 501
Course:	Computer Networks
CO-1	Demonstrate the concepts of data communication at physical layer and compare ISO - OSI model with TCP/IP model.
CO-2	Explore different design issues at data link layer
CO-3	Design the network using IP addressing and sub netting / supernetting schemes
CO-4	Analyze transport layer protocols and congestion control algorithms.
CO-5	Explore protocols at application layer
CO-6	Understand the customer requirements and Apply a Methodology to Network Design and software defined networks

Course Code:	CSC 502
Course:	Web Computing
CO-1	Select protocols or technologies required for various web applications
CO-2	Apply JavaScript to add functionality to web pages.
CO-3	Design front end application using basic React.
CO-4	Construct web based Node.js applications using Express
CO-5	Design front end applications using functional components of React.
CO-6	Design back-end applications using Node.js

Course Code:	CSC 503
Course:	Artificial Intelligence
CO-1	Identify the characteristics of the environment and differentiate between various agent architectures.
CO-2	Apply the most suitable search strategy to design problem solving agents.
CO-3	Represent a natural language description of statements in logic and apply the inference rules to design Knowledge Based agents.
CO-4	Apply a probabilistic model for reasoning under uncertainty.
CO-5	Comprehend various learning techniques.
CO-6	Describe the various building blocks of an expert system for a given real word problem.

Course Code:	CSC 504

Course:	Data Warehouse and Mining
CO-1	Organize strategic data in an enterprise and build a data Warehouse.
CO-2	Analyze data using OLAP operations so as to take strategic decisions and Demonstrate an understanding of the importance of data mining.
CO-3	Organize and Prepare the data needed for data mining using pre preprocessing techniques
CO-4	Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on large data sets.
CO-5	Define and apply metrics to measure the performance of various data mining algorithms
CO-6	Understand Concepts related to Web mining modelling.

Course Code:	CSDLO5011
Course:	Statistics for Artificial IntelligenceData Science
CO-1	To Perform exploratory analysis on the datasets
CO-2	To Understand the various distribution and sampling
CO-3	To Perform Hypothesis Testing on datasets
CO-4	To Explore different techniques for Summarizing Data
CO-5	To Perform The Analysis of Variance
CO-6	Use Linear Least Squares

Course Code:	CSDL05012
Course:	Advanced Algorithms
CO-1	Analyze the classification of problems into various NP classes and their Computational Intractability
CO-2	Describe, apply and analyze the complexity of Approximation Algorithms.
CO-3	Describe, apply and analyze the complexity of Randomized Algorithms.
CO-4	Describe, apply and analyze the complexity of Local Search Algorithms
CO-5	Design and Apply the concepts of String and Amortized Analysis
CO-6	To Understand Combinatorial Analysis techniques

Course Code:	CSDLO5013
Course:	Internet Programming
CO-1	Describe the Characteristics and Conceptual Framework of IoT.
CO-2	Differentiate between the levels of the IoT architectures
CO-3	Analyze the IoT access technologies.

CO-4	Illustrate various edge to cloud protocol for IoT
CO-5	Apply IoT analytics and data visualization.
CO-6	Analyze and evaluate IoT applications.

Course Code:	CSL 501
Course:	Web Computing and Network Lab
CO-1	Identify and apply the appropriate HTML tags to develop a webpage.
CO-2	Identify and apply the appropriate CSS tags to format data on webpage
CO-3	Construct responsive websites using Bootstra
CO-4	Use JavaScript to develop interactive web pages
CO-5	Construct front end applications using React and back end using Node.js/express
CO-6	Use simulator for CISco packet tracer/GNS3

Course Code:	CSL 502
Course:	Artificial Intelligence Lab
CO-1	Identify suitable Agent Architecture for a given real world AI problem
CO-2	Implement simple programs using Prolog
CO-3	Implement various search techniques for a Problem-Solving Agent
CO-4	Represent natural language description as statements in Logic and apply inference rules to it.
CO-5	Construct a Bayesian Belief Network for a given problem and draw probabilistic inferences from it

Course Code:	CSL 503
Course:	Data Warehouse and Mining Lab
CO-1	Build a data warehouse
CO-2	Analyze data using OLAP operations so as to take strategic decisions.
CO-3	Demonstrate an understanding of the importance of data mining
CO-4	Organize and Prepare the data needed for data mining using pre preprocessing techniques.
CO-5	D Perform exploratory analysis of the data to be used for mining
CO-6	Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on large data sets

Course Code:	CSL 504
Course:	Business and Communication Ethics
CO-1	Plan and prepare effective business/ technical documents which will in turn provide solid foundation for their future managerial roles.

CO-2	Strategize their personal and professional skills to build a professional image and meet the demands of the industry.
CO-3	Emerge successful in group discussions, meetings and result-oriented agreeable solutions in group communication situations.
CO-4	Deliver persuasive and professional presentations.
CO-5	Develop creative thinking and interpersona l skills required for effective professional communication.
CO-6	Apply codes of ethical conduct, personal integrity and norms of organizational behaviour.

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Course Code:	CSM 501
Course:	MiniProject – 2 A
CO-1	Identify Methodology for solving above problem and apply engineering knowledge and skills to solve it
CO-2	Validate, Verify the results using test cases/benchmark data/theoretical/ inferences/experiments/simulations
CO-3	Analyze and evaluate the impact of solution/product/research/innovation /entrepreneurship towards societal/environmental/sustainable development
CO-4	Use standard norms of engineering practices and project management principles during project work.
CO-5	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.
CO-6 **CO-7**	Gain technical competency towards participation in Competitions, Hackathons, etc Demonstrate capabilities of self-learning, leading to lifelong learning
CO-8	Develop interpersonal skills to work as a member of a group or as leaders
CO-9	Identify Methodology for solving above problem and apply engineering knowledge and skills to solve it

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

Course Code:	CSC 601
Course:	Data Analytics and Visualization
CO-1	Apply qualitative and quantitative techniques to understand the data
CO-2	Formulate testable hypotheses and evaluate them using common statistical analyses
CO-3	Perform regression analysis on a given data set for prediction and forecasting
CO-4	Apply ANOVA method to find the statistical differences between the means in a given data
CO-5	Fit an ARIMA model for prediction and forecasting of time series data
CO-6	Translate the data into visual context to identify patterns, trends and outliers in large data sets.

Course Code:	CSC 602
Course:	Cryptography and System Security
CO-1	Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory
CO-2	Understand, compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
CO-3	Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes
CO-4	Apply different digital signature algorithms to achieve authentication and create secure applications
CO-5	Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP
CO-6	Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

Course Code:	CSC 603
Course:	Software Engineering and Project Management
CO-1	Understand and use basic knowledge in software engineering.
CO-2	Identify requirements, analyze and prepare models
CO-3	Plan, schedule and track the progress of the projects
CO-4	Design & develop the software solutions for the growth of society
CO-5	Apply testing and assure quality in software solutions

CO-6	Generate project schedule and can construct, design and develop network diagram for different type of Projects.

Course Code:	CSC 604
Course:	MachineLearning
CO-1	Comprehend basics of Machine Learning
CO-2	Build Mathematical foundation for machine learning
CO-3	Understand various Machine learning models
CO-4	Select suitable Machine learning models for a given problem
CO-5	Build Neural Network based models
CO-6	Apply Dimensionality Reduction techniques

Course Code:	CSDLO6011
Course:	High Performance Computing
CO-1	Understand the fundamentals of parallel Computing.
CO-2	Describe different parallel processing platforms involved in achieving High Performance Computing
CO-3	Demonstrate the principles of Parallel Algorithms and their execution.
CO-4	Evaluate the performance of HPC systems.
CO-5	Apply HPC programming paradigm to parallel applications in IoT
CO-6	Discuss different current HPC Platforms.

Course Code:	CSDLO6012
Course:	Distributed Computing
CO-1	Demonstrate knowledge of the basic elements and concepts related to distributed system technologies.
CO-2	Illustrate the middleware technologies that support distributed applications such as RPC, RMI and Object based middleware
CO-3	Analyze the various techniques used for clock synchronization and mutual exclusion
CO-4	Demonstrate the concepts of Resource and Process management and synchronization algorithms
CO-5	Demonstrate the concepts of Consistency and Replication Management
CO-6	Apply the knowledge of Distributed File System to analyze various file systems like NFS, AFS and the experience in building large-scale distributed applications

Course Code:	CSDLO6013
Course:	Image and Video Processing
CO-1	To gain fundamental knowledge of Image processin
CO-2	To apply image enhancement techniques
CO-3	To apply image segmentation and compression techniques.
CO-4	To gain an in-depth understanding of image transforms
CO-5	To gain fundamental understanding of video processing

Course Code:	CSL 601
Course:	Data Analytics and Visualization Lab
CO-1	Use graph libraries such as matplotlib/Seaborn/Excel plots. 2 3 4
CO-2	Perform exploratory data analysis and prepare the data for fitting a model
CO-3	Build a statistical model (Regression, ANOVA, ARIMA) on a given data set.
CO-4	Apply suitable visualization techniques to get insights from a given data set language and

Course Code:	CSL 602
Course:	Cryptographic and system security Lab
CO-1	apply the knowledge of symmetric and asymmetric cryptography to implement simple ciphers.
CO-2	Analyze and implement public key algorithms like RSA and El Gamal
CO-3	Analyze and evaluate performance of hashing algorithms
CO-4	Explore the different network reconnaissance tools to gather information about networks
CO-5	Use tools like sniffers, port scanners and other related tools for analyzing packets in a network.
CO-6	Apply and set up firewalls and intrusion detection systems using open source technologies and to explore email security.

Course Code:	CSL 603
Course:	Software Engineering andProject Management Lab
CO-1	To understand the fundamentals of DevOps engineering and be fully proficient with DevOps terminologies, concepts, benefits, and deployment options to meet your business requirements 2 3 4 5. 6
CO-2	To obtain complete knowledge of the —version control system‖ to effectively track changes augmented with Git and GitHub
CO-3	Understand the importance of Selenium and Jenkins to test Software Applications
CO-4	To understand the importance of Jenkins to Build and deploy Software Applications on server environment
CO-5	To understand concept of containerization and Analyze the Containerization of OS images and deployment of applications over Dockerk
CO-6	To Synthesize software configuration and provisioning using Ansible.

Course Code:	CSL 604
Course:	Machine Learning Lab
CO-1	Implement various Machine learning models
CO-2	Apply suitable Machine learning models for a given problem
CO-3	Implement Neural Network based models
CO-4	Apply Dimensionality Reduction techniques

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

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Course Code:	CSM 601
Course:	Mini Project – 2B
CO-1	Identify societal/research/innovation/entrepreneurship problems through appropriate literature surveys
CO-2	Identify Methodology for solving above problem and apply engineering knowledge and skills to solve it
CO-3	Validate, Verify the results using test cases/benchmark data/theoretical/ inferences/experiments/simulations
CO-4	Analyze and evaluate the impact of solution/product/research/innovation /entrepreneurship towards societal/environmental/sustainable development
CO-5	Use standard norms of engineering practices and project management principles during project work
CO-6	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.
CO-7	Gain technical competency towards participation in Competitions, Hackathons, etc
CO-8	Demonstrate capabilities of self-learning, leading to lifelong learning
CO-9	Develop interpersonal skills to work as a member of a group or as leader