SREE NARAYANA GURUKULAM
COLLEGE OF ENGINEERING

[Affiliated to APJ Abdul Kalam Technological University, Kerala]
Kadayiruppu P O, Ernakulam, Kerala – 682 311

Department of Computer Science and Engineering		
BTech in Computer Science and Engineering 2019 - Scheme		
Semester I		
Course Code & Course Name	**CO No**	**CO Description**
HUN 101 LIFE SKILLS	CO1	Define and Identify different life skills required in personal and professional life
	CO2	Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.
	CO3	Explain the basic mechanics of effective communication and demonstrate these through presentations.
	CO4	Take part in group discussions
	CO5	Use appropriate thinking and problem solving techniques to solve new problems
	CO6	Understand the basics of teamwork and leadership

Semester II		
Course Code & Course Name	**CO No**	**CO Description**
EST 102 PROGRAMING IN C	CO1	Analyze a computational problem and develop an algorithm/flowchart to find its solution
	CO2	Develop readable* C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators.
	CO3	Write readable C programs with arrays, structure or union for storing the data to be processed
	CO4	Divide a given computational problem into a number of modules and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem
	CO5	Write readable C programs which use pointers for array processing and parameter passing
	CO6	Develop readable C programs with files for reading input and storing output

HUN102 PROFESSIONAL COMMUNICATION	CO1	Develop vocabulary and language skills relevant to engineering as a profession
	CO2	Analyze, interpret and effectively summarize a variety of textual content
	CO3	Create effective technical presentations
	CO4	Discuss a given technical/non-technical topic in a group setting and arrive at generalizations/consensus
	CO5	Identify drawbacks in listening patterns and apply listening techniques for specific needs
	CO6	Create professional and technical documents that are clear and adhering to all the necessary conventions

Semester 3		
Course Code & Course Name	**CO No**	**CO Description**
MAT 203 DISCRETE MATHEMATICAL STRUCTURES	CO1	Check the validity of predicates in Propositional and Quantified Propositional Logic using truth tables, deductive reasoning and inference theory on Propositional Logic(Cognitive Knowledge Level: Apply)
	CO2	Solve counting problems by applying the elementary counting techniques - Rule of Sum, Rule of Product, Permutation, Combination, Binomial Theorem, Pigeonhole Principle and Principle of Inclusion and Exclusion (Cognitive Knowledge Level: Apply)
	CO3	Classify binary relations into various types and illustrate an application for each type of binary relation, in Computer Science (Cognitive Knowledge Level:Understand)
	CO4	Illustrate an application for Partially Ordered Sets and Complete Lattices, in Computer Science (Cognitive Knowledge Level: Apply)
	CO5	Explain Generating Functions and solve First Order and Second Order Linear Recurrence Relations with Constant Coefficients (Cognitive Knowledge Level:Apply)
	CO6	Illustrate the abstract algebraic systems - Semigroups, Monoids, Groups, Homomorphism and Isomorphism of Monoids and Groups (Cognitive Knowledge Level: Understand)

CST 202 DATA STRUCTURES	CO1	Design an algorithm for a computational task and calculate the time/space complexities of that algorithm (Cognitive Knowledge Level: Apply)
	CO2	Identify the suitable data structure (array or linked list) to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem (Cognitive Knowledge Level: Apply)
	CO3	Write an algorithm to find the solution of a computational problem by selecting an appropriate data structure (binary tree/graph) to represent a data item to be processed(Cognitive Knowledge Level: Apply)
	CO4	Store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set (Cognitive Knowledge Level: Apply)
	CO5	Select appropriate sorting algorithms to be used in specific circumstances (Cognitive Knowledge Level: Analyze)
	CO6	Design and implement Data Structures for solving real world problems efficiently (Cognitive Knowledge Level: Apply)
CST 203 LOGIC SYSTEM DESIGN	CO1	Illustrate decimal, binary, octal, hexadecimal and BCD number systems, perform conversions among them and do the operations - complementation, addition, subtraction, multiplication and division on binary numbers (Cognitive Knowledgelevel: Understand)
	CO2	Simplify a given Boolean Function and design a combinational circuit to implement the simplified function using Digital Logic Gates (Cognitive Knowledge level:Apply)
	CO3	Design combinational circuits - Adders, Code Convertors, Decoders, MagnitudeComparators, Parity Generator/Checker and design the Programmable Logic Devices -ROM and PLA. (Cognitive Knowledge level: Apply)
	CO4	Design sequential circuits - Registers, Counters and Shift Registers. (CognitiveKnowledge level: Apply)
	CO5	Use algorithms to perform addition and subtraction on binary, BCD and floating point numbers (Cognitive Knowledge level: Understand)
CST 205 OBJECT ORIENTED PROGRAMMING USING	CO1	Write Java programs using the object oriented concepts - classes, objects, constructors, data hiding, inheritance and polymorphism (Cognitive Knowledge Level: Apply)

JAVA	CO2	Utilise datatypes, operators, control statements, built in packages & interfaces, Input/ Output Streams and Files in Java to develop programs (Cognitive Knowledge Level: Apply)
	CO3	Illustrate how robust programs can be written in Java using exception handling mechanism (Cognitive Knowledge Level: Understand)
	CO4	Write application programs in Java using multithreading and database connectivity(Cognitive Knowledge Level: Apply)
	CO5	Write Graphical User Interface based application programs by utilising event handling features and Swing in Java (Cognitive Knowledge Level: Apply)
MCN201 SUSTAINABLE ENGINEERING	CO1	Understand the relevance and the concept of sustainability and the global initiatives in this direction
	CO2	Explain the different types of environmental pollution problems and their sustainable solutions
	CO3	Discuss the environmental regulations and standards
	CO4	Outline the concepts related to conventional and non-conventional energy
	CO5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles
CSL 201 DATA STRUCTURES LAB	CO1	Write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements (Cognitive Knowledge Level: Analyse)
	CO2	Write a time/space efficient program to sort a list of records based on a given key in the record (Cognitive Knowledge Level: Apply)
	CO3	Examine a given Data Structure to determine its space complexity and time complexities of operations on it (Cognitive Knowledge Level: Apply)
	CO4	Design and implement an efficient data structure to represent given data (Cognitive Knowledge Level: Apply)
	CO5	Write a time/space efficient program to convert an arithmetic expression from one notation to another (Cognitive Knowledge Level: Apply)
	CO6	Write a program using linked lists to simulate Memory Allocation and Garbage Collection (Cognitive Knowledge Level: Apply)

	CO	
CSL 203 OBJECT-ORIENTED PROGRAMMING LAB (IN JAVA)	CO1	Implement the Object Oriented concepts - constructors, inheritance, method overloading & overriding and polymorphism in Java (Cognitive Knowledge Level:Apply)
	CO2	Implement programs in Java which use datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and Files (Cognitive Knowledge Level: Apply)
	CO3	Implement robust application programs in Java using exception handling (Cognitive Knowledge Level: Apply)
	CO4	Implement application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: Apply)
	CO5	Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java (Cognitive Knowledge Level: Apply)

Semester 4		
Course Code & Course Name	**CO**	**CO Description**
CST202 COMPUTER ORGANIZATION AND ARCHITECTURE	CO1	Recognize and express the relevance of basic components, I/O organization and pipelining schemes in a digital computer (Cognitive knowledge: Understand
	CO2	Explain the types of memory systems and mapping functions used in memory systems (Cognitive Knowledge Level: Understand)
	CO3	Demonstrate the control signals required for the execution of a given instruction (Cognitive Knowledge Level: Apply))
	CO4	Illustrate the design of Arithmetic Logic Unit and explain the usage of registers in it (Cognitive Knowledge Level: Apply)
	CO5	Explain the implementation aspects of arithmetic algorithms in a digital computer (Cognitive Knowledge Level:Apply)
	CO6	Develop the control logic for a given arithmetic problem (Cognitive Knowledge Level: Apply
CST204 DATABASE MANAGEMENT SYSTEMS	CO1	Summarize and exemplify the fundamental nature and characteristics of database systems
	CO2	Model real word scenarios given as informal descriptions, using Entity Relationship diagrams.

	CO3	Model and design solutions for efficiently representing and querying data using the relational model
	CO4	Demonstrate the features of indexing and hashing in database application
	CO5	Discuss and compare the aspects of Concurrency Control and Recovery in Database systems
	CO6	Explain various types of NoSQL databases
EST200 DESIGN AND ENGINEERING	CO1	Explain the different concepts and principles involved in design engineering.
	CO2	Apply design thinking while learning and practicing engineering
	CO3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.
MCN202 CONSTITUTION OF INDIA	CO1	Explain the background of the present constitution of India and features.
	CO2	Utilize the fundamental rights and duties.
	CO3	Understand the working of the union executive, parliament and judiciary.
	CO4	Understand the working of the state executive, legislature and judiciary
	CO5	Utilize the special provisions and statutory institutions.
	CO6	Show national and patriotic spirit as responsible citizens of the country
CSL202 DIGITAL LAB	CO1	Design and implement combinational logic circuits using Logic Gates
	CO2	Realise various types of flip flops using gates.
	CO3	Design and implement counters.
	CO4	Implement various type of shift registers
	CO5	Simulate functioning of digital circuits using programs written in a Hardware Description Language
	CO6	Function effectively as an individual and in a team to accomplish a given task of designing and implementing digital circuits
CSL204 OPERATING	CO1	IIIustrate the use of system calls in operating systems

SYSTEMS LAB	CO2	Implement process creation and interprocess communication and process synchronisation in operating systems
	CO3	Implement FCFS,SJF,RR and priority based CPU Scheduling algorithms
	CO4	IIIustrate the performance of FIFO,LRU and OPT page replacement algorithms
	CO5	Implement modules for deadlock detection and deadlock avoidance in operating systems
	CO6	Implement modules for storage management and disk scheduling in operating systems.

Semester 5		
Course Code & Course Name	**CO No**	**CO Description**
CST 301 FORMAL LANGUAGES AND AUTOMATA THEORY	CO1	Classify a given formal language into Regular, Context-Free, ContextSensitive, Recursive or Recursively Enumerable. [Cognitive level: knowledge)
	CO2	Explain a formal representation of a given regular language as a finite state automaton, regular grammar, regular expression and Myhill-Nerode relation.
	CO3	Design a Pushdown Automaton and a Context-Free Grammar for a given context-free language.
	CO4	Design Turing machines as language acceptors or transducers.
	CO5	Explain the notion of decidability.
CST 303 COMPUTER NETWORKS	CO1	Explain the features of computer networks, protocols, and network design models(Cognitive Knowledge: Understand)
	CO2	Describe the fundamental characteristics of the physical layer and identify the usage in network communication (Cognitive Knowledge: Apply)
	CO3	Explain the design issues of data link layer, link layer protocols, bridges and switches (Cognitive Knowledge: Understand)
	CO4	Illustrate wired LAN protocols (IEEE 802.3) and wireless LAN protocols (IEEE 802.11) (Cognitive Knowledge: Understand)
	CO5	Select appropriate routing algorithms, congestion control techniques, and Quality of Service requirements for a network (Cognitive Knowledge: Apply)

	CO6	Illustrate the functions and protocols of the network layer, transport layer, and application layer in inter-networking (Cognitive Knowledge: Understand)
CST 305 SYSTEM SOFTWARE	CO1	Student will understand the role played by system software such as assembler, interpreter, linker, loader and compilers in the development of IT solutions.
	CO2	Identify standard and extended architectural features of machines.
	CO3	Able to design, analyze and implement one pass, two pass or multi pass assembler
	CO4	Students will design, analyze and implement loader and linker
	CO5	Students will be able to design, analyze and implement macro processors and Understand the features of device drivers and editing & debugging tools.
CST 307MICROPROCESSORS AND MICROCONTROLLERS	CO1	Illustrate the architecture, modes of operation and addressing modes of microprocessors (Cognitive Level :Understand)
	CO2	Develop 8086 assembly language programs.
	CO3	Demonstrate interrupts, its handling and programming in 8086.
	CO4	Illustrate how different peripherals (8255,8254,8257) and memory are interfaced with microprocessors.
	CO5	Outline features of microcontrollers and develop low level programs.
CST309 MANAGEMENT OF SOFTWARE SYSTEMS	CO1	Demonstrate Traditional and Agile Software Development approaches (Cognitive Knowledge Level: Apply) U
	CO2	Prepare Software Requirement Specifications and Software Design for a given problem. (Cognitive Knowledge Level: Apply)
	CO3	Justify the significance of design patterns and licensing terms in software development, prepare testing, maintenance and DevOps strategies for a project. (Cognitive Knowledge Level: Apply)
	CO4	Make use of software project management concepts while planning, estimation, scheduling, tracking and change management of a project, with a traditional/agile framework. (Cognitive Knowledge Level: Apply)
	CO5	Utilize SQA practices, Process Improvement techniques and Technology advancements in cloud based software models and containers & microservices. (Cognitive Knowledge Level: Apply)

MCN301 DISASTER MANAGEMENT	CO1	Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle
	CO2	Distinguish between different hazard types and vulnerability types and do vulnerability assessment
	CO3	Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk
	CO4	Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community
	CO5	Identify factors that determine the nature of disaster response and discuss the various disaster response actions
	CO6	Explain the various legislations and best practices for disaster management and risk reduction at national and international level
CSL331 SYSTEM SOFTWARE AND MICROPROCESSOR LAB	CO1	Develop 8086 programs and execute it using a microprocessor kit.
	CO2	Develop 8086 programs and, debug and execute it using MASM assemblers
	CO3	Develop and execute programs to interface stepper motor, 8255, 8279 and digital to analog converters with 8086 trainer kit
	CO4	Implement and execute different scheduling and paging algorithms in OS
	CO5	Design and implement assemblers, Loaders and macroprocessors.
CSL333 DATABASE MANAGEMENT SYSTEMS LAB	CO1	Design database schema for a given real world problem-domain using standard design and modeling approaches. (Cognitive Knowledge Level: Apply)
	CO2	Construct queries using SQL for database creation, interaction, modification, and updation. (Cognitive Knowledge Level: Apply)
	CO3	Design and implement triggers and cursors. (Cognitive Knowledge Level: Apply)
	CO4	Implement procedures, functions, and control structures using PL/SQL. (Cognitive Knowledge Level: Apply)
	CO5	Perform CRUD operations in NoSQL Databases. (Cognitive Knowledge Level: Apply)
	CO6	Develop database applications using front-end tools and back-end DBMS. (Cognitive Knowledge Level: Create)

Semester 6		
Course Code & Course Name	**CO No**	**CO Description**
CST302 COMPILER DESIGN	CO1	Explain the phases in compilation process(lexical analysis, syntax analysis, semantic analysis, intermediate code generation, code optimization and code generation) and model a lexical analyzer (Cognitive Knowledge Level: Apply)
	CO2	Model language syntax using Context Free Grammar and develop parse tree representation using leftmost and rightmost derivations (Cognitive Knowledge Level: Apply)
	CO3	Compare different types of parsers(Bottom-up and Top-down) and construct parser for a given grammar (Cognitive Knowledge Level: Apply)
	CO4	Build Syntax Directed Translation for a context free grammar, compare various storage allocation strategies and classify intermediate representations (Cognitive Knowledge Level: Apply)
	CO5	Illustrate code optimization and code generation techniques in compilation (Cognitive Knowledge Level: Apply)
CST 304 COMPUTER GRAPHICS AND IMAGE PROCESSING	CO1	Describe the working principles of graphics devices(Cognitive Knowledge level: Understand)
	CO2	Illustrate line drawing, circle drawing and polygon filling algorithms(Cognitive Knowledge level: Apply)
	CO3	Demonstrate geometric representations, transformations on 2D & 3D objects, clipping algorithms and projection algorithms(Cognitive Knowledge .LEVEL Apply)
	CO4	Summarize visible surface detection methods(Cognitive Knowledge level: Understand)
	CO5	Summarize the concepts of digital image representation, processing and demonstrate pixel relationships(Cognitive Knowledge level: Apply)
	CO6	Solve image enhancement and segmentation problems using spatial domain techniques(Cognitive Knowledge level: Apply)
CST306 ALGORITHM ANALYSIS AND DESIGN	CO1	Analyze any given algorithm and express its time and space complexities in asymptotic notations. (Cognitive Level: Apply)
	CO2	Derive recurrence equations and solve it using Iteration, Recurrence Tree, Substitution and Master's Method to compute time complexity of algorithms. (Cognitive Level: Apply)

	CO3	Illustrate Graph traversal algorithms & applications and Advanced Data structures like AVL trees and Disjoint set operations. (Cognitive Level: Apply)
	CO4	Demonstrate Divide-and-conquer, Greedy Strategy, Dynamic programming, Branch-and Bound and Backtracking algorithm design techniques (Cognitive Level: Apply)
	CO5	Classify a problem as computationally tractable or intractable, and discuss strategies to address intractability (Cognitive Level: Understand)
	CO6	Identify the suitable design strategy to solve a given problem. (Cognitive Level: Analyze)
CST322 DATA ANALYTICS	CO1	Illustrate the mathematical concepts for data analytics (Cognitive Knowledge Level: Apply)
	CO2	Explain the basic concepts of data analytics (Cognitive Knowledge Level: Understand)
	CO3	Illustrate various predictive and descriptive analytics algorithms (Cognitive Knowledge Level: Apply)
	CO4	Describe the key concepts and applications of Big Data Analytics (Cognitive Knowledge Level: Understand)
	CO5	Demonstrate the usage of Map Reduce paradigm for Big Data Analytics (Cognitive Knowledge Level: Apply)
	CO6	Use R programming tool to perform data analysis and visualization (Cognitive Knowledge Level: Apply)
CST 332 FOUNDATIONS OF SECURITY IN COMPUTING	CO1	Illustrate the operations and properties of algebraic structures, integer arithmetic and modular arithmetic. (Cognitive Knowledge Level: Understand)
	CO2	Use the concepts of prime numbers and factorization for ensuring security in computing systems (Cognitive Knowledge Level: Apply)
	CO3	Illustrate the concepts of Linear Congruence, Primitive Roots, Discrete Logarithms and Elliptic Curve Arithmetic (Cognitive Knowledge Level: Apply)
	CO4	Summarize the threats and attacks related to computer and program security
	CO5	Outline the key aspects of operating system and database security (Cognitive Knowledge Level: Understand)
HUT 300 INDUSTRIAL ECONOMICS AND FOREIGN TRADE	CO1	Explain the problem of scarcity of resources and consumer behaviour, and to evaluate the impact of government policies on the general economic welfare.(Cognitive knowledge level: Understand)

	CO2	Take appropriate decisions regarding volume of output and to evaluate the social cost of production. (Cognitive knowledge level: Apply)
	CO3	Determine the functional requirement of a firm under various competitive conditions. (Cognitive knowledge level: Analyse)
	CO4	Examine the overall performance of the economy, and the regulation of economic fluctuations and its impact on various sections in the society. (Cognitive knowledge level: Analyse)
	CO5	Determine the impact of changes in global economic policies on the business opportunities of a firm. (Cognitive knowledge level: Analyse)
CST 308 COMPREHENSIVE COURSE WORK	CO1	Comprehend the concepts of discrete mathematical structures (Cognitive Knowledge Level: Understand)
	CO2	Comprehend the concepts and applications of data structures (Cognitive Knowledge Level: Understand)
	CO3	Comprehend the concepts, functions and algorithms in Operating System (Cognitive Knowledge Level: Understand))
	CO4	Comprehend the organization and architecture of computer systems (Cognitive Knowledge Level: Understand)
	CO5	Comprehend the fundamental principles of database design and manipulation (Cognitive Knowledge Level: Understand)
	CO6	Comprehend the concepts in formal languages and automata theory Cognitive Knowledge Level: Understand)
CSL 332 NETWORKING LAB	CO1	Use network related commands and configuration files in Linux Operating System. (Cognitive Knowledge Level: Understand).
	CO2	Use network related commands and configuration files in Linux Operating System. (Cognitive Knowledge Level: Understand).
	CO3	Analyze network traffic using network monitoring tools. (Cognitive Knowledge Level: Apply)\
	CO4	Design and setup a network and configure different network protocols.(Cognitive Knowledge Level: Apply)
	CO5	Develop simulation of fundamental network concepts using a network simulator.(Cognitive Knowledge Level: Apply)

CSD 334 MINI PROJECT	CO1	Identify technically and economically feasible problems (Cognitive Knowledge Level: Apply)
	CO2	Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes (Cognitive Knowledge Level: Apply)
	CO3	Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions of minimal complexity by using modern tools & advanced programming techniques (Cognitive Knowledge Level: Apply)
	CO4	Prepare technical report and deliver presentation (Cognitive Knowledge Level: Apply)
	CO5	Apply engineering and management principles to achieve the goal of the project (Cognitive Knowledge Level: Apply)

Semester 7		
Course Code & Course Name	**CO No**	**CO Description**
CST401 ARTIFICIAL INTELLIGENCE	CO1	Explain the fundamental concepts of intelligent systems and their architecture. (Cognitive Knowledge Level: Understanding)
	CO2	Illustrate uninformed and informed search techniques for problem solving in intelligent systems. (Cognitive Knowledge Level: Understanding)
	CO3	Solve Constraint Satisfaction Problems using search techniques. (Cognitive Knowledge Level: Apply)
	CO4	Represent AI domain knowledge using logic systems and use inference techniques for reasoning in intelligent systems. (Cognitive Knowledge Level: Apply)
	CO5	Illustrate different types of learning techniques used in intelligent systems (Cognitive Knowledge Level: Understand)
CSL411 COMPILER LAB	CO1	Implement lexical analyzer using the tool LEX. (Cognitive Knowledge Level: Apply)
	CO2	Implement Syntax analyzer using the tool YACC. (Cognitive Knowledge Level: Apply)
	CO3	Design NFA and DFA for a problem and write programs to perform operations on it. (Cognitive Knowledge Level: Apply)
	CO4	Design and Implement Top-Down parsers. (Cognitive Knowledge Level: Apply)
	CO5	Design and Implement Bottom-Up parsers. (Cognitive Knowledge Level: Apply)

	CO6	Implement intermediate code for expressions. (Cognitive Knowledge Level: Apply)
CSQ413 SEMINAR	CO1	Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: Apply).
	CO2	Read and apprehend an academic document from the literature which is related to her/his areas of interest (Cognitive knowledge level: Analyze).
	CO3	Prepare a presentation about an academic document (Cognitive knowledge level: Create).
	CO4	Give a presentation about an academic document (Cognitive knowledge level: Apply).
	CO5	Prepare a technical report (Cognitive knowledge level:Create).
CSD415 PROJECT PHASE I	CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
	CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
	CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
	CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
	CO5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
	CO6	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).
CST413 MACHINE LEARNING	CO1	Illustrate Machine Learning concepts and basic parameter estimation methods. (Cognitive Knowledge Level: Apply)
	CO2	Demonstrate supervised learning concepts (regression, linear classification). (Cognitive Knowledge Level: Apply)
	CO3	Illustrate the concepts of Multilayer neural network and Support Vector Machine (Cognitive Knowledge Level: Apply)
	CO4	Describe unsupervised learning concepts and dimensionality reduction techniques. (Cognitive Knowledge Level: Apply)
	CO5	Solve real life problems using appropriate machine learning models and evaluate the performance measures (Cognitive Knowledge Level: Apply)
CST423 CLOUD COMPUTING	CO1	Explain the various cloud computing models and services. (Cognitive Knowledge Level: Understand)

	CO2	Demonstrate the significance of implementing virtualization techniques. (Cognitive Knowledge Level: Understand)
	CO3	Explain different cloud enabling technologies and compare private cloud platforms (Cognitive Knowledge Level: Understand)
	CO4	Apply appropriate cloud programming methods to solve big data problems. (Cognitive Knowledge Level: Apply)
	CO5	Describe the need for security mechanisms in cloud (Cognitive Knowledge Level: Understand)
	CO6	Compare the different popular cloud computing platforms (Cognitive Knowledge Level: Understand)
CST433 SECURITY IN COMPUTING	CO1	Identify the security services provided against different types of security attacks. (Cognitive Knowledge Level: Understand)
	CO2	Illustrate classical encryption techniques for information hiding. (Cognitive Knowledge Level: Apply)
	CO3	Illustrate symmetric/asymmetric key cryptosystems for secure communication. (Cognitive Knowledge Level: Apply)
	CO4	Explain message integrity and authentication methods in a secure communication scenario. (Cognitive Knowledge Level: Understand)
	CO5	Interpret public/secret key distribution techniques for secure communication. (Cognitive Knowledge Level: Understand)
	CO6	Identify the effects of intruders, malicious software and distributed denial of service attacks on system security. (Cognitive Knowledge Level: Understand)
CST435 COMPUTER GRAPHICS	CO1	Describe the working principles of graphics devices(Cognitive Knowledge level: Understand)
	CO2	Illustrate line drawing, circle drawing and polygon filling algorithms(Cognitive Knowledge level: Apply)
	CO3	Demonstrate geometric representations and transformations on 2D & 3D objects (Cognitive Knowledge level: Apply)
	CO4	Demonstrate the working of line and polygon clipping algorithms(Cognitive Knowledge level: Apply)
	CO5	Summarize visible surface detection methods and illustrate projection algorithms. (Cognitive Knowledge level: Apply)

Semester 8		
Course Code & Course Name	**CO No**	**CO Description**
CST402 DISTRIBUTED COMPUTING	CO1	Summarize various aspects of distributed computation model and logical time. (Cognitive Knowledge Level: Understand)
	CO2	Illustrate election algorithm, global snapshot algorithm and termination detection algorithm. (Cognitive Knowledge Level: Apply)
	CO3	Compare token based, non-token based and quorum based mutual exclusion algorithms. (Cognitive Knowledge Level: Understand)
	CO4	Recognize the significance of deadlock detection and shared memory in distributed systems. (Cognitive Knowledge Level: Understand)
	CO5	Explain the concepts of failure recovery and consensus. (Cognitive Knowledge Level: Understand)
	CO6	Illustrate distributed file system architectures. (Cognitive Knowledge Level: Understand)
CSD416 PROJECT PHASE II	CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
	CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
	CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
	CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
	CO5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
	CO6	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).
CST434 NETWORK SECURITY PROTOCOLS	CO1	Explain authentication protocols, X.509 authentication service and Public Key Infrastructure (PKI).(Cognitive Knowledge Level: Understand)
	CO2	Identify the security mechanisms in E mail security services. (Cognitive Knowledge Level: Understand)
	CO3	Summarize the network and transport layer security services provided in a secure communication scenario. (Cognitive Knowledge Level: Apply)
	CO4	Describe real time communication security and application layer security protocols.

		(Cognitive Knowledge Level: Apply)
	CO5	Explain the concepts of firewalls and wireless network security. (Cognitive Knowledge Level: Understand)
CST466 DATA MINING	CO1	Employ the key process of data mining and data warehousing concepts in application domains. (Cognitive Knowledge Level: Understand)
	CO2	Make use of appropriate preprocessing techniques to convert raw data into suitable format for practical data mining tasks (Cognitive Knowledge Level: Apply)
	CO3	Illustrate the use of classification and clustering algorithms in various application domains (Cognitive Knowledge Level: Apply)
	Co4	Comprehend the use of association rule mining techniques. (Cognitive Knowledge Level: Apply)
	CO5	Explain advanced data mining concepts and their applications in emerging domains (Cognitive Knowledge Level: Understand)
CST448 INTERNET OF THINGS	CO1	Outline the fundamentals of IoT and its underlying physical and logical architecture(Cognitive Knowledge Level: Understand)
	CO2	Explain the hardware architectures for IoT (Cognitive Knowledge Level : Understand)
	CO3	Outline the Network architectures for IoT(Cognitive Knowledge Level : Understand)
	CO4	Implement data analytics on the IoT platforms (Cognitive Knowledge Level : Apply)
	CO5	Appreciate the security considerations in IoT (Cognitive Knowledge Level : Understand)
	CO6	Implement IoT applications using the available hardware and software. (Cognitive Knowledge Level : Apply)