



**The institution has stated learning outcomes (programme and course outcome)/graduate attributes which are integrated into the assessment process and widely publicized through the website and other documents and the attainment of the same are evaluated by the institution**

In strict compliance with the objectives of Outcome Based Education (OBE), the Program Outcomes (POs), Program Specific Outcomes (PSOs) and Course Outcomes (COs) are framed by the department offering the concerned program after rigorous consultation with all faculty and the stakeholders. After attainment of consensus, the same are widely propagated and publicized through various means such as display and/or communication specified hereunder.

- Website
- Curriculum /regulations books
- Class rooms
- Department Notice Boards
- Laboratories
- Student Induction Programs
- Meetings/ Interactions with employers
- Parent meet
- Faculty meetings
- Alumni meetings
- Professional Body meetings
- Library

While addressing the students, the HODs create awareness on POs, PSOs and COs. The faculty members, class teachers, mentors, course coordinators, program/ISO coordinators also inform the students and create awareness and emphasize the need to attain the outcomes.

Program specific outcomes (PSOs) are the specific skill requirements and accomplishments to be fulfilled by the students at micro level and by the end of the program. The programme coordinators prepare the PSOs, usually two to four in number, in consultation with course coordinators. The BOS, including Head of the Department and subject experts, of the individual departments will discuss the same and approve it after endorsement by the Principal.

Program Outcomes (POs) are broad statements that describe the professional accomplishments which the program aims at, and these are to be attained by the students by the time they complete the program. POs incorporate many areas of inter-related knowledge, skills and personality traits that are to be acquired by the students during their graduation.

Course outcomes (COs) are direct statements that describe the essential and enduring disciplinary knowledge, abilities that students should possess and the depth of learning that is expected upon completion of a course. They are clearly specified and communicated. The Course Outcomes are prepared by the course coordinator in consultation with concerned faculty members teaching the same course. The Module coordinator will verify it. Finally, they are discussed in the concerned department's BOS meeting course-wise and approved.

The POs/PSOs of the programme are published through electronic media at individual Department site located on the college website <http://www.amritasai.org.in/>. The COs of the courses are also published through electronic media at the Department site located on the college website: <http://www.amritasai.org.in/>. In all the interactions with the students, awareness on POs, PSOs and COs is consciously promoted.

## AR22 COURSE OUTCOMES:

### COURSE OUTCOMES - EEE

**SEM-III****NAME OF THE SUBJECT: Numerical Methods and Complex Variables**

CO1	Calculate a root of algebraic and transcendental equations.
CO2	Compute interpolating polynomial for the given data. Explain relation between the finite difference operators.
CO3	Solve ordinary differential equations numerically using Euler's and RK method.
CO4	Verify analyticity of functions.
CO5	Calculate Taylor and Laurent series for functions
CO6	Use line and contour integration to evaluate integrals, Use residues to evaluate integrals.

**NAME OF THE SUBJECT: Electrical Circuits**

CO1	Solve Various electrical networks in presence of active and passive elements.
CO2	Understand network topology concepts.
CO3	Solve any magnetic circuit with various dot conventions.
CO4	Analyse R, L, C network with sinusoidal excitation.
CO5	Plot locus diagrams for sires R-L&R-C Circuits.
CO6	Solve any electrical network by Network theorems

**NAME OF THE SUBJECT: ELECTRICAL MACHINES**

CO1	To study transformer construction, operation, various tests, efficiency and voltage regulation.
CO2	To study about DC machines, operation, performance, applications, recent advancements.
CO3	To study induction motor operation, find efficiency and speed regulation.
CO4	To study of synchronous machine and its applications.

**NAME OF THE SUBJECT: Electronic Devices & Circuits**

CO1	Understand the PN junction operation and distinguish between drift and diffusion currents.
CO2	Plot the electric field distribution across the junctions.
CO3	Employ PN- Junction diode as a circuit element.
CO4	Employ the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.
CO5	Distinguish between properties of BJT and MOSFET with reference to packing density and power dissipation.
CO6	Illustrate the fabrication processes for CMOS inverter

**NAME OF THE SUBJECT: DATA STRUCTURES**

CO1	Distinguish between procedures and object oriented programming.
CO2	Apply advanced data structure strategies for exploring complex data structures.

CO3	Compare and contrast various data structures and design techniques in the area of Performance.
CO4	Implement data structure algorithms through C++. • Incorporate data structures into the applications such as binary search trees, AVL and B Trees
CO5	Implement all data structures like stacks, queues, and compare their Performance and trade offs
CO6	Implement all data structures like trees, lists and graphs and compare their Performance and trade offs

#### **SEM-IV**

#### **NAME OF THE SUBJECT:Probability and Statistics**

CO1	Examine, analyze, and compare various Probability distributions for Discrete and Continuous random variable
CO2	Test the hypothesis concerning mean, proportion and variance and perform ANOVA test.
CO3	Fit a curve to the numerical data and establish a relationship between two are more variables.
CO4	Evaluate clustering models to find useful patterns in unsupervised data.
CO5	Preparing different control charts and check whether the process is in control or not

#### **NAME OF THE SUBJECT:Control Systems**

CO1	Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graph.
CO2	Determine time response specifications of second order systems and to determine error
CO3	Analyze absolute and relative stability of LTI systems using rouths stability criterion and root locus method
CO4	Analyze the stability of LTI system using frequency response methods
CO5	Design lag,lead,lag-lead compensators to improve system performance from bode plot
CO6	Represent physical systems as state models and determine the response. Understanding the concepts of controllability

#### **NAME OF THE SUBJECT:Java Programming**

CO1	Able to realize the concept of Object Oriented Programming & Java Programming Constructs
CO2	Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
CO3	Apply the concept of exception handling and Input/ Output operations
CO4	Able to design the applications of Java & Java applet
CO5	Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit

#### **NAME OF THE SUBJECT:Computer Architecture and Organization**

CO1	Apply digital engineering fundamentals to acquire knowledge of arithmetic algorithms for different processors
CO2	Interpret the concept of Basic processor system with reference to 8085 processor and Analyze the performance of Implementing the techniques of pipelining and parallelism to analyze the performance of a Processor.
CO3	Apply the conceptual knowledge of system development with appropriate I/O Interface.
CO4	Interpret various techniques for efficient memory utilization to develop a system application.

#### **NAME OF THE SUBJECT:Electromagnetic Fields**

CO1	Determine electric fields and potential using Gauss's law or solving Laplace's or Poisson's equations, for various electric charge distributions
CO2	Calculate and design capacitance, energy stored in dielectrics

CO3	Calculate the magnetic field intensity due to current, the application of ampere's law and the Maxwell's second and third equations
CO4	determine the magnetic forces and torque produced by currents in magnetic field
CO5	determine self and mutual inductances and the energy stored in the magnetic field.
CO6	calculate induced e.m.f., understand the concepts of displacement current and Poynting vector
<b>SEM-V</b>	
<b>NAME OF THE SUBJECT:Power Electronics Converters</b>	
CO1	Explain the characteristics of various power semiconductor devices and analyze the static and dynamic characteristics of SCR's., Design firing circuits for SCR.
CO2	Explain the operation of single phase & 3 phase full-wave converters and analyze harmonics in the input current.
CO3	Analyze the operation of different types of DC-DC converters.
CO4	Explain the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
CO5	Analyze the operation of AC-AC regulators.
<b>NAME OF THE SUBJECT:Signals &amp; Systems</b>	
CO1	Characterize the signals and systems and principles of vector spaces, Concept of orthogonality.
CO2	Analyze the continuous-time signals and continuous-time systems using Fourier series, Fourier transform and Laplace transform.
CO3	Understand the relationships among the various representations of LTI systems
CO4	Understand the Concepts of convolution, correlation, Energy and Power density spectrum and their relationships.
CO5	Apply Laplace transform to analyze discrete-time signals and systems.
CO6	Apply z-transform to analyze discrete-time signals and systems.
<b>NAME OF THE SUBJECT:Electrical Measurements &amp; Instrumentation</b>	
CO1	Able to Choose right type of instrument for measurement of ac and dc Electrical quantities.
CO2	Able to Choose right type of instrument for measurement of power and power factor.
CO3	Able to Select right type for measurement of R, L,C.
CO4	Understand the effectiveness of Transducer.
CO5	Able to understand Digital Meters.
<b>NAME OF THE SUBJECT:PULSE AND DIGITAL CIRCUITS</b>	
CO1	Analyze linear wave shaping circuits.
CO2	Analyze non-linear wave shaping circuits.
CO3	Apply the fundamental concepts of wave shaping for various switching circuits.
CO4	Apply the fundamental concepts of wave shaping for various signal generating circuits.
CO5	Analyze different time base generators.
CO6	Study different types of Logic families and Logic Gates.
<b>NAME OF THE SUBJECT:SWITCHING THEORY &amp; LOGIC DESIGN</b>	

CO1	Understand the number systems, Boolean algebra and conversion
CO2	minimize the Boolean algebra by using Boolean postulates
CO3	Analyze the combinational logic circuit by using Boolean algebra
CO4	Analyze the memory and arrays of logic system
CO5	Analyze the sequential logic circuit by using Boolean algebra
CO6	Design the sequential logic circuit by using finite state machine

#### **SEM-VI**

##### **NAME OF THE SUBJECT:Linear And Digital Integrated Circuit Applications**

CO1	Illustrate the internal circuit, parameters and features of op-amp.
CO2	Design of linear and non-linear circuits using op- amp.
CO3	Design and analyze various applications using ICs, such as 741, 555, 723 etc.,.
CO4	Define specifications of digital IC and select appropriate IC based on specifications.
CO5	Design and analyze applications using different combinational and Sequential circuits (IC's)

##### **NAME OF THE SUBJECT:Power Systems**

CO1	Identify the different components of thermal power plants.
CO2	Identify the different components of nuclear Power plants.
CO3	Distinguish between AC/DC distribution systems and also estimate voltage drops of distribution systems.
CO4	Identify the different components of air and gas insulated substations.
CO5	Identify single core and multi core cables with different insulating materials.
CO6	Analyze the different economic factors of power generation and tariffs.

##### **NAME OF THE SUBJECT:Micro Processor & Micro Controllers**

CO1	Summarize architectural features of 8086 $\mu$ p.
CO2	Interface and program 8086 $\mu$ p with memory, PPI, timer and DMA.
CO3	Apply the knowledge of Architectural features of 8051 $\mu$ c to program 8051 $\mu$ c.
CO4	Interface and program on chip peripherals of 8051 $\mu$ c.
CO5	Interface off chip peripherals with 8051 $\mu$ c and design a system around 8051 $\mu$ c based system

##### **NAME OF THE SUBJECT:UTILIZATION OF ELECTRICAL ENERGY**

CO1	identify a suitable motor for electric drives and industrial applications
CO2	identify most appropriate heating or welding techniques for suitable applications.
CO3	understand various level of illuminosity produced by different illuminating sources.
CO4	estimate the illumination levels produced by various sources and recommend the most efficient illuminating sources and should be able to design different lighting systems by taking inputs and constraints in view.
CO5	determine the speed/time characteristics of different types of traction motors.
CO6	estimate energy consumption levels at various modes of operation.

#### **SEM-VII**

<b>NAME OF THE SUBJECT:Universal Human Values</b>	
CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
CO3	Understand the role of a human being in ensuring harmony in society and nature.
CO4	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.
<b>NAME OF THE SUBJECT:POWER SYSTEM OPERATION &amp; CONTROL</b>	
CO1	compute optimal scheduling of Generators.
CO2	understand hydrothermal scheduling.
CO3	Understand the unit commitment problem.
CO4	Understand importance of the frequency.
CO5	Understand importance of PID controllers in single area and two area systems
CO6	understand reactive power control and compensation for transmission line.
<b>NAME OF THE SUBJECT:Switched Mode Power Conversion</b>	
CO1	Analyze operation and control of non-isolated and isolated switch mode converters.
CO2	Design of non-isolated and isolated switch mode converters.
CO3	Analyze operation and control of resonant converters.
CO4	Feedback design of switch mode converters based on linearized models.
<b>NAME OF THE SUBJECT:SWITCH GEAR &amp; PROTECTION</b>	
CO1	understand the principles of arc interruption for application to high voltage circuit breakers of air, oil, vacuum, SF6 gas type.
CO2	understand the working principle and operation of different types of electromagnetic protective relays.
CO3	Students acquire knowledge of faults and protective schemes for high power generator
CO4	Students acquire knowledge of faults and protective schemes for high power transformers.
CO5	understand different types of static relays and their applications.
CO6	understand different types of over voltages and protective schemes required for insulation co-ordination
<b>NAME OF THE SUBJECT:AI APPLICATIONS TO ELECTRICAL ENGINEERING</b>	
CO1	Able to Understand feed forward neural networks, feedback neural networks and learning techniques.
CO2	Able to Analyse fuzziness involved in various systems and fuzzy set theory.
CO3	Able to Develop fuzzy logic control for applications in electrical engineering
CO4	Able to Develop genetic algorithm for applications in electrical engineering.
<b>NAME OF THE SUBJECT:ENERGY AUDIT, CONSERVATION &amp; MANAGEMENT</b>	
CO1	Explain energy efficiency, conservation and various technologies.
CO2	Design energy efficient lighting systems.
CO3	Calculate power factor of systems and propose suitable compensation techniques.

CO4	Explain energy conservation in HVAC systems
CO5	Calculate life cycle costing analysis and return on investment on energy efficient technologies.
CO6	Calculate investment on energy efficient technologies.
<b>NAME OF THE SUBJECT:ELECTRICAL DISTRIBUTION SYSTEMS</b>	
CO1	Able to understand various factors of distribution system.
CO2	Able to design the substation and feeders.
CO3	Able to determine the voltage drop and power loss
CO4	Able to understand the protection and its coordination.
CO5	Able to understand the effect of compensation for p.f improvement.
CO6	Able to understand the effect of voltage control
<b>NAME OF THE SUBJECT:Flexible Alternating Current Transmission Systems</b>	
CO1	Understand power flow control in transmission lines using FACTS controllers.
CO2	Explain operation and control of voltage source converter
CO3	Analyze compensation methods to improve stability and reduce power oscillations in the transmission lines.
CO4	Explain the method of shunt compensation using static VAR compensators.
CO5	Understand the methods of compensations using series compensators.
CO6	Explain operation of Unified Power Flow Controller (UPFC).
<b>NAME OF THE SUBJECT:Power Quality</b>	
CO1	Differentiate between different types of power quality problems.
CO2	Explain the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system
CO3	Analyze power quality terms and power quality standards
CO4	Explain the principle of voltage regulation and power factor improvement methods.
CO5	Demonstrate the relationship between distributed generation and power quality
CO6	Explain the power quality monitoring concepts and the usage of measuring instruments
<b>NAME OF THE SUBJECT: Special Electrical Machines</b>	
CO1	Distinguish between brush dc motor and brush less dc motor
CO2	Explain the performance and control of stepper motors, and their applications.
CO3	Explain theory of operation and control of switched reluctance motor.
CO4	Explain the theory of travelling magnetic field and applications of linear motors.
CO5	Understand the significance of electrical motors for traction drives
CO6	Understand the significance of Linear Induction Motors (LIM)
<b>NAME OF THE SUBJECT:PROJECT</b>	
CO1	Illustrate the research problem by using acquired knowledge

CO2	Evaluate executable project modules
CO3	Employ latest tools for designing project modules with high accuracy
CO4	Summarize all work through effective team work
CO5	Analyze the testing of project modules
CO6	Evaluate the completed task and focus the project report.

**COURSE OUTCOMES - ECE**

**SEM-III**

**NAME OF THE SUBJECT: Numerical Methods and Complex Variables**

CO1	Calculate a root of algebraic and transcendental equations.
CO2	Compute interpolating polynomial for the given data. Explain relation between the finite difference operators.
CO3	Solve ordinary differential equations numerically using Euler's and RK method.
CO4	Verify analyticity of functions.
CO5	Calculate Taylor and Laurent series for functions
CO6	Use line and contour integration to evaluate integrals, Use residues to evaluate integrals.

**NAME OF THE SUBJECT: SWITCHING THEORY AND LOGIC DESIGN**

CO1	Understand the number systems, Boolean algebra and conversion
CO2	minimize the Boolean algebra by using Boolean postulates
CO3	Analyze the combinational logic circuit by using Boolean algebra
CO4	Analyze the memory and arrays of logic system
CO5	Analyze the sequential logic circuit by using Boolean algebra
CO6	Design the sequential logic circuit by using finite state machine

**NAME OF THE SUBJECT: Electronic Devices and Circuits**

CO1	Understand the PN junction operation and distinguish between drift and diffusion currents.
CO2	Plot the electric field distribution across the junctions.
CO3	Employ PN- Junction diode as a circuit element.
CO4	Employ the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.
CO5	Distinguish between properties of BJT and MOSFET with reference to packing density and power dissipation.
CO6	Illustrate the fabrication processes for CMOS inverter

**NAME OF THE SUBJECT: Signals and Systems**

CO1	Characterize the signals and systems and principles of vector spaces, Concept of orthogonality.
CO2	Analyze the continuous-time signals and continuous-time systems using Fourier series, Fourier transform and Laplace transform.
CO3	Understand the relationships among the various representations of LTI systems
CO4	Understand the Concepts of convolution, correlation, Energy and Power density spectrum and their relationships.



CO5	Apply Laplace transform to analyze discrete-time signals and systems.
CO6	Apply z-transform to analyze discrete-time signals and systems.
<b>NAME OF THE SUBJECT:Analog and Digital Communication</b>	
CO1	Understand the principles of Analog Communication systems.
CO2	Describe different pulse communication systems
CO3	Analyze various noises in communication systems.
CO4	Demonstrate various digital communication techniques
CO5	Perform analysis on the performance of spread spectrum modulation format
<b>NAME OF THE SUBJECT: Indian Traditional Knowledge</b>	
CO1	Understand the concept of Traditional knowledge and its importance
CO2	Know the need and importance of protecting traditional knowledge
CO3	Know the various enactments related to the protection of traditional knowledge
CO4	Understand the concepts of Intellectual property to protect the traditional knowledge
CO5	Understand the traditional knowledge in different sectors.
<b>SEM-IV</b>	
<b>NAME OF THE SUBJECT:Probability and Statistics</b>	
CO1	Examine, analyze, and compare various Probability distributions for Discrete and Continuous random variable
CO2	Test the hypothesis concerning mean, proportion and variance and perform ANOVA test.
CO3	Fit a curve to the numerical data and establish a relationship between two are more variables.
CO4	Evaluate clustering models to find useful patterns in unsupervised data.
CO5	Preparing different control charts and check whether the process is in control or not
<b>NAME OF THE SUBJECT:Electronic Circuit Analysis</b>	
CO1	Design and analysis of small signal high frequency transistor amplifier using BJT.
CO2	Design and analysis of multi stage amplifiers using BJT and FET and Differential amplifier using BJT
CO3	Know the types of feedbacks and generalized analysis of negative feedback amplifiers
CO4	Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept
CO5	Know the classification of the power and tuned amplifiers and their analysis with performance comparison.
<b>NAME OF THE SUBJECT:Electromagnetic waves and Transmission lines</b>	
CO1	Apply the fundamental of electric and magnetic field.
CO2	Solve for electric potential and energy density due to different charged objects.
CO3	Apply concepts of magneto statics to evaluate the magnetic fields for different engineering problems
CO4	Formulation of Maxwell's equations for time varying electromagnetic fields.
CO5	Analyze the characteristics of electromagnetic waves through the boundaries of different media and in transmission lines.

<b>NAME OF THE SUBJECT:CIRCUIT THEORY</b>	
CO1	Solve various electrical networks in presence of active and passive elements.
CO2	Understand network topology concepts
CO3	Solve any magnetic circuit with various dot conventions.
CO4	Analyze & plot locus diagrams for R- L, L-C, R-C network with sinusoidal excitation
CO5	Solve any electrical network by Network theorems.
<b>NAME OF THE SUBJECT:Computer Architecture and Organization</b>	
CO1	Apply digital engineering fundamentals to acquire knowledge of arithmetic algorithms for different processors
CO2	Interpret the concept of Basic processor system with reference to 8085 processor and Analyze the performance of Implementing the techniques of pipelining and parallelism to analyze the performance of a Processor.
CO3	Apply the conceptual knowledge of system development with appropriate I/O Interface.
CO4	Interpret various techniques for efficient memory utilization to develop a system application.
<b>SEM-V</b>	
<b>NAME OF THE SUBJECT:Control Systems</b>	
CO1	Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graph.
CO2	Determine time response specifications of second order systems and to determine error
CO3	Analyze absolute and relative stability of LTI systems using rouths stability criterion and root locus method
CO4	Analyze the stability of LTI system using frequency response methods
CO5	Design lag,lead,lag-lead compensators to improve system performance from bode plot
CO6	Represent physical systems as state models and determine the response. Understanding the concepts of controllability
<b>NAME OF THE SUBJECT:Pulse and digital circuits</b>	
CO1	Understand the applications of diode as integrator, differentiator, Utilize the non-sinusoidal signals in many experimental research areas.
CO2	Apply the fundamental concepts of wave shaping for various switching and signal generating circuits.
CO3	Learn various switching devices such as diode, transistor
CO4	Importance of clock pulse and its generating techniques, Design multivibrators, for various applications.
CO5	Learn synchronization techniques, Design sweep circuits
<b>NAME OF THE SUBJECT:VLSI Design</b>	
CO1	Acquire fundamental knowledge on MOSFET characteristics and its parameters
CO2	Analyze the fabrication process and physical design of CMOS circuits
CO3	Identify the suitable basic digital building blocks in the design of digital systems.
CO4	Comprehend the need of hardware description language and its features
CO5	Explain various modeling styles of architecture declaration
<b>SEM-VI</b>	
<b>NAME OF THE SUBJECT:Microprocessors and Microcontrollers</b>	

CO1	Summarize architectural features of 8086 $\mu$ p.
CO2	Interface and program 8086 $\mu$ p with memory, PPI, timer and DMA.
CO3	Apply the knowledge of Architectural features of 8051 $\mu$ c to program 8051 $\mu$ c.
CO4	Interface and program on chip peripherals of 8051 $\mu$ c.
CO5	Interface off chip peripherals with 8051 $\mu$ c and design a system around 8051 $\mu$ c based system
<b>NAME OF THE SUBJECT: Integrated Circuit Applications</b>	
CO1	Illustrate the internal circuit, parameters, features of op-amp ,linear and non linear applications of op-amp
CO2	Design different types of active filters & understand voltage regulators.
CO3	Design and analyze various applications using ICs, such as 555,565,566.
CO4	Evaluate the performance of ADC and DAC.
CO5	Design and analyze applications using different combinational and Sequential circuits (IC's)
<b>NAME OF THE SUBJECT: ANTENNA and Microwave Engineering</b>	
CO1	Summarize the basic concepts of antenna parameters.
CO2	Use the concept of electromagnetic theory for design of various antennas.
CO3	Able to design microstrip antennas for various applications.
CO4	Apply the knowledge of microwave physics for different microwave devices.
CO5	Able to measure S-matrix for microwave devices
<b>COURSE OUTCOMES - CSE</b>	
<b>SEM-III</b>	
<b>NAME OF THE SUBJECT: DATA STRUCTURES</b>	
CO1	Summarize the properties, interfaces, and behaviors of basic abstract data types
CO2	Discuss the computational efficiency of the principal algorithms for sorting & searching
CO3	Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
CO4	Demonstrate different methods for traversing trees
<b>NAME OF THE SUBJECT: OBJECT ORIENTED PROGRAMMING THROUGH C++</b>	
CO1	Classify object oriented programming and procedural programming
CO2	Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
CO3	Build C++ classes using appropriate encapsulation and design principles
CO4	Apply object oriented or non-object oriented techniques to solve bigger computing problems
<b>NAME OF THE SUBJECT: COMPUTER ORGANIZATION</b>	
CO1	Develop a detailed understanding of computer systems
CO2	Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations

CO3	Develop a detailed understanding of architecture and functionality of central processing unit
CO4	Exemplify in a better way the I/O and memory organization
CO5	Illustrate concepts of parallel processing, pipelining and inter processor communication
<b>NAME OF THE SUBJECT:UNIX PROGRAMMING</b>	
CO1	Understand the basic concepts of UNIX Architecture and basic Commands.
CO2	Understand the basic file system commands, concepts of Shell programming.
CO3	Understand the concepts UNIX API's and process control.
CO4	Understand the concepts of process accounting, User identification and different IPC mechanisms.
CO5	Understand signal handling mechanism, daemon characteristics, coding rules and error logging.
<b>SEM-IV</b>	
<b>NAME OF THE SUBJECT:JAVA PROGRAMMING</b>	
CO1	Able to realize the concept of Object Oriented Programming & Java Programming Constructs
CO2	Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
CO3	Apply the concept of exception handling and Input/ Output operations
CO4	Able to design the applications of Java & Java applet
CO5	Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit
<b>NAME OF THE SUBJECT:DATABASE MANAGEMENT SYSTEMS</b>	
CO1	Describe a relational database and object-oriented database.
CO2	Create, maintain and manipulate a relational database using SQL
CO3	Describe ER model and normalization for database design.
CO4	Examine issues in data storage and query processing and can formulate appropriate solutions.
CO5	Understand the role and issues in management of data such as efficiency, privacy, security, ethical responsibility and Strategic advantage.
CO6	Design and build database system for a given real world problem
<b>NAME OF THE SUBJECT:Data Mining</b>	
CO1	To fully understand standard data mining methods and techniques such as association rules, data clustering and classification.
CO2	Learn new, advanced techniques for emerging applications (e.g. social network analysis, stream data mining).
CO3	Gain practical intuition about how to apply these techniques on datasets of realistic sizes using modern data analysis frameworks.
<b>NAME OF THE SUBJECT:OPERATING SYSTEMS</b>	
CO1	Describe various generations of Operating System and functions of Operating System
CO2	Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
CO3	Solve Inter Process Communication problems using Mathematical Equations by various methods
CO4	Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement x Techniques

CO5	Outline File Systems in Operating System like UNIX/Linux and Windows
<b>SEM-V</b>	
<b>NAME OF THE SUBJECT:ADVANCED JAVA PROGRAMMING</b>	
CO1	To be familiarize with RMI and JSP
CO2	To understand the Java Servlets and Database connectivity
CO3	To Know more about the Enterprise Java Bean (EJB) Programming
<b>NAME OF THE SUBJECT:SOFTWARE ENGINEERING</b>	
CO1	How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment
CO2	An ability to work in one or more significant application domains
CO3	Work as an individual and as part of a multidisciplinary team to develop and deliver quality software
CO4	Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle
CO5	Demonstrate an ability to use the techniques and tools necessary for engineering practice
<b>NAME OF THE SUBJECT:BIG DATA ANALYTICS</b>	
CO1	Understand Big Data and its analytics in the real world
CO2	Analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics
CO3	Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm
CO4	Design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics
CO5	Implement Big Data Activities using Hive
<b>NAME OF THE SUBJECT:OBJECT ORIENTED ANALYSIS AND DESIGN</b>	
CO1	Ability to find solutions to the complex problems using object oriented approach
CO2	Represent classes, responsibilities and states using UML notation
CO3	Identify classes and responsibilities of the problem domain
<b>NAME OF THE SUBJECT:Ad hoc and sensor networks</b>	
CO1	Explain the concepts, network architectures and applications of ad hoc and wireless sensor networks
CO2	Analyze the protocol design issues of ad hoc and sensor networks
CO3	Design routing protocols for ad hoc and wireless sensor networks with respect to someprotocol design issues
CO4	Evaluate the QoS related performance measurements of ad hoc and sensor networks.
<b>NAME OF THE SUBJECT:INTRODUCTION TO DEEP LEARNING</b>	
CO1	Ability to understand the concepts of Neural Networks
CO2	Abilityto select the Learning Networks in modeling real world systems
CO3	Ability to use an efficient algorithm for Deep Models
<b>NAME OF THE SUBJECT:INTRODUCTION TO CRYPTOGRAPHY</b>	
CO1	Provide security of the data over the network.

CO2	Do research in the emerging areas of cryptography and network security.
CO3	Implement various networking protocols.
CO4	Protect any network from the threats in the world.
<b>NAME OF THE SUBJECT:DATA SCIENCE USING CLOUD</b>	
CO1	Understanding the key dimensions of the challenge of Cloud Computing
CO2	Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization
CO3	Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
CO4	Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas
<b>SEM-VI</b>	
<b>NAME OF THE SUBJECT:COMPUTER NETWORKS</b>	
CO1	Understand OSI and TCP/IP models
CO2	Analyze MAC layer and congestion control algorithms understand how internet works
<b>NAME OF THE SUBJECT:WEB TECHNOLOGIES</b>	
CO1	Students are able to develop a dynamic webpage by the use of java script and DHTML.
CO2	Students will be able to write a well formed / valid XML document.
CO3	Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
CO4	Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
CO5	Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.
<b>NAME OF THE SUBJECT:FORMAL LANGUAGES AND AUTOMATA THEORY</b>	
CO1	Classify machines by their power to recognize languages
CO2	Employ finite state machines to solve problems in computing,
CO3	Explain deterministic and non-deterministic machines
CO4	Comprehend the hierarchy of problems arising in the computer science
<b>NAME OF THE SUBJECT:EMBEDDED SYSTEMS</b>	
CO1	Understand the microprocessor architecture and its components used in embedded systems
CO2	Write the 8051 assembly language code for specific purposes
CO3	impliment code for interfacing various devices.
CO4	Develop simple embedded systems for real time operations
CO5	Compose simple embedded system with error free software to obtain target system
<b>NAME OF THE SUBJECT:Cognitive Computing</b>	
CO1	Understand basics of Cognitive Computing and its differences from traditional
CO2	Approaches of Computing. . Plan and use the primary tools associated with cognitive computing
CO3	Plan and execute a project that leverages Cognitive Computing.

<b>NAME OF THE SUBJECT:SOFT COMPUTING</b>	
CO1	Understand soft computing techniques and their role in problem solving.
CO2	Conceptualize and parameterize various problems to be solved through basic soft computing techniques.
CO3	Analyze and integrate various soft computing techniques in order to solve problems effectively and efficiently.
<b>NAME OF THE SUBJECT:EDGE COMPUTING</b>	
CO1	Explore the need for new computing paradigms.
CO2	Explain major components of fog and edge computing architectures.
CO3	Identify potential technical challenges of the transition process and suggest solutions.
CO4	Analyze data and application requirements and pertaining issues.
CO5	Design and model infrastructures.
<b>SEM-VII</b>	
<b>NAME OF THE SUBJECT:DATA VISUALIZATION</b>	
CO1	Understand the fundamental design principles and different types of data visualization.
CO2	Identify both positive and negative impacts of data-informed decision across a variety of domains.
CO3	Apply the fundamental concepts of data visualization to define a project in your field of study.
CO4	Practice the core principles using widely available tools (e.g. Tableau).
CO5	Demonstrate the best practice that presents your story in the process of creating data visualization including connecting to different data sources, assessing to the quality of the data, and converting raw data into data visualizations that provide actionable information.
<b>NAME OF THE SUBJECT:BIG DATA TECHNOLOGIES</b>	
CO1	Illustrate the usage of data on different Big data ecosystems.
CO2	Demonstrate the Pig architecture and evaluation of pig scripts.
CO3	Describe the Hive architecture and execute SQL queries on sample data sets.
CO4	Understand the process of transferring data between different file systems and to execute operations using sqoop.
CO5	Understand the concepts of indexing and use these concepts in solr search engine.
CO6	Implement and evaluate the data manipulation procedures using pig, hive, sqoop and solr. Develop an application using different eco system tools by taking standard sample data set.
<b>NAME OF THE SUBJECT:WEB ANALYTICS</b>	
CO1	Understand the Web analytics
CO2	Identify Different Data Collection and Web Analytics Strategies
CO3	Apply Different Web Analytics Tools
CO4	Summarize Various Google Analytics and testing
<b>NAME OF THE SUBJECT:Ethical Hacking</b>	
CO1	Understand the core foundations of ethics in regards to computer security
CO2	Learn about the hacker mindset and the history of hackers
CO3	Understand basic networking and security technologies

C04	Gain a basic understanding of security policy
C05	Learn about basic system defense infrastructure
<b>NAME OF THE SUBJECT:Introduction to cyber forensics</b>	
C01	Understand the basic terminology of cybercrimes
C02	Apply a number of different computer forensic tools to a given scenario
C03	Understand the basics of computer forensics
C04	Analyze and validate digital evidence data
C05	Analyze acquisition methods for digital evidence related to system security
<b>NAME OF THE SUBJECT:Natural Language Processing</b>	
C01	able to understand the wide spectrum of problem statements, tasks, and solution approaches within NLP
C02	able to implement and evaluate different NLP applications and apply machine learning and deep learning methods for this process.
C03	Evaluate various algorithms and approaches for the given task, dataset, and stage of the NLP product.
C04	Understand best practices, opportunities, and the roadmap for NLP from a business and product leader's perspective.
<b>NAME OF THE SUBJECT: Fuzzy Logic</b>	
C01	understand the basic ideas of fuzzy sets, operations and properties of fuzzy sets and also about fuzzy relations.
C02	understand the basic features of membership functions, fuzzification process and defuzzification process.
C03	design fuzzy rule based system.
C04	know about combining fuzzy set theory with probability to handle random and non-random uncertainty, and the decision making process.
C05	gain the knowledge about fuzzy C-Means clustering.
<b>NAME OF THE SUBJECT:Semantic web</b>	
C01	Understand the concept structure of the semantic web technology and how this technology revolutionizes the World Wide Web.
C02	Understand the concepts of Web Science, semantics of knowledge and resource, ontology.
C03	Describe logic semantics and inference with OWL.
C04	Use ontology engineering approaches in semantic applications
C05	Learn Web graph processing for various applications such as search engine, community detection
C06	Program web applications and graph processing techniques using Python
<b>NAME OF THE SUBJECT:Cyber security</b>	
C01	Identifying System and application security threats and vulnerabilities
C02	Identifying different classes of attacks
C03	Cyber Security incidents to apply appropriate response
C04	Describing risk management processes and practices
C05	Evaluation of decision making outcomes of Cyber Security scenarios
<b>NAME OF THE SUBJECT:Perl programming</b>	



CO1	To identify basic perl constructs and to outline perl debugging commands.
CO2	To create and design simple perl programs with the available perl pre-defined functions.
CO3	To demonstrate perl subroutines and perl references
CO4	To Apply Data Structures on perl programs and perl formats.
CO5	To install HTTP server and to design and execute perl programs through CGI.

**NAME OF THE SUBJECT:Distributed systems**

CO1	Develop a familiarity with distributed file systems.
CO2	Describe important characteristics of distributed systems and the salient architectural features of such systems.
CO3	Describe the features and applications of important standard protocols which are used in distributed systems.
CO4	Gaining practical experience of inter-process communication in a distributed environment

**NAME OF THE SUBJECT:Green computing**

CO1	Describe the concepts of how to manage the green IT with necessary components.
CO2	Select hardware and software to facilitate more sustainable operation.
CO3	Relate the green computing practices to save energy.
CO4	Find the use of IT in relation to environmental perspectives.
CO5	Explain the issues related with green computing.
CO6	Identify the various laws, standards and protocols for regulating green IT.

**NAME OF THE SUBJECT:Angular JS**

CO1	Use operators, variables, arrays, control structures, functions and objects in Java Script.
CO2	Map HTML using the DOM - Document Object Model.
CO3	Use regular expressions for form validation.
CO4	Using Angular JS along with HTML and CSS

**NAME OF THE SUBJECT:PROJECT**

CO1	Illustrate the research problem by using acquired knowledge
CO2	Evaluate executable project modules
CO3	Employ latest tools for designing project modules with high accuracy
CO4	Summarize all work through effective team work
CO5	Analyze the testing of project modules
CO6	Evaluate the completed task and focus the project report.

**COURSE OUTCOMES - CIC**

**SEM-III**

**NAME OF THE SUBJECT:DATA STRUCTURES**

CO1	Summarize the properties, interfaces, and behaviors of basic abstract data types
-----	--

CO2	Discuss the computational efficiency of the principal algorithms for sorting & searching
CO3	Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
CO4	Demonstrate different methods for traversing trees
<b>NAME OF THE SUBJECT:OBJECT ORIENTED PROGRAMMING THROUGH C++</b>	
CO1	Classify object oriented programming and procedural programming
CO2	Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
CO3	Build C++ classes using appropriate encapsulation and design principles
CO4	Apply object oriented or non-object oriented techniques to solve bigger computing problems
<b>NAME OF THE SUBJECT:COMPUTER ORGANIZATION</b>	
CO1	Develop a detailed understanding of computer systems
CO2	Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
CO3	Develop a detailed understanding of architecture and functionality of central processing unit
CO4	Exemplify in a better way the I/O and memory organization
CO5	Illustrate concepts of parallel processing, pipelining and inter processor communication
<b>NAME OF THE SUBJECT:Microprocessors and Microcontrollers</b>	
CO1	Summarize architectural features of 8086 $\mu$ p.
CO2	Interface and program 8086 $\mu$ p with memory, PPI, timer and DMA.
CO3	Apply the knowledge of Architectural features of 8051 $\mu$ c to program 8051 $\mu$ c.
CO4	Interface and program on chip peripherals of 8051 $\mu$ c.
CO5	Interface off chip peripherals with 8051 $\mu$ c and design a system around 8051 $\mu$ c based system
<b>SEM-IV</b>	
<b>NAME OF THE SUBJECT:JAVA PROGRAMMING</b>	
CO1	Able to realize the concept of Object Oriented Programming & Java Programming Constructs
CO2	Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
CO3	Apply the concept of exception handling and Input/ Output operations
CO4	Able to design the applications of Java & Java applet
CO5	Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit
<b>NAME OF THE SUBJECT:DATABASE MANAGEMENT SYSTEMS</b>	
CO1	Describe a relational database and object-oriented database.
CO2	Create, maintain and manipulate a relational database using SQL
CO3	Describe ER model and normalization for database design.
CO4	Examine issues in data storage and query processing and can formulate appropriate solutions.

CO5	Understand the role and issues in management of data such as efficiency, privacy, security, ethical responsibility and Strategic advantage.
CO6	Design and build database system for a given real world problem
<b>NAME OF THE SUBJECT:OPERATING SYSTEMS</b>	
CO1	Describe various generations of Operating System and functions of Operating System
CO2	Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
CO3	Solve Inter Process Communication problems using Mathematical Equations by various methods
CO4	Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement x Techniques
CO5	Outline File Systems in Operating System like UNIX/Linux and Windows
<b>SEM-V</b>	
<b>NAME OF THE SUBJECT:ADVANCED JAVA PROGRAMMING</b>	
CO1	To be familiarize with RMI and JSP
CO2	To understand the Java Servlets and Database connectivity
CO3	To Know more about the Enterprise Java Bean (EJB) Programming
<b>NAME OF THE SUBJECT:SOFTWARE ENGINEERING</b>	
CO1	How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment
CO2	An ability to work in one or more significant application domains
CO3	Work as an individual and as part of a multidisciplinary team to develop and deliver quality software
CO4	Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle
CO5	Demonstrate an ability to use the techniques and tools necessary for engineering practice
<b>NAME OF THE SUBJECT:INTRODUCTION TO CYBER SECURITY</b>	
CO1	Identifying System and application security threats and vulnerabilities
CO2	Identifying different classes of attacks
CO3	Cyber Security incidents to apply appropriate response
CO4	Describing risk management processes and practices
CO5	Evaluation of decision making outcomes of Cyber Security scenarios
<b>NAME OF THE SUBJECT:OBJECT ORIENTED ANALYSIS AND DESIGN</b>	
CO1	Ability to find solutions to the complex problems using object oriented approach
CO2	Represent classes, responsibilities and states using UML notation
CO3	Identify classes and responsibilities of the problem domain
<b>NAME OF THE SUBJECT: Ad hoc and sensor networks</b>	
CO1	Explain the concepts, network architectures and applications of ad hoc and wireless sensor networks

CO2	Analyze the protocol design issues of ad hoc and sensor networks
CO3	Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues
CO4	Evaluate the QoS related performance measurements of ad hoc and sensor networks.
<b>NAME OF THE SUBJECT:INTRODUCTION TO DEEP LEARNING</b>	
CO1	Ability to understand the concepts of Neural Networks
CO2	Ability to select the Learning Networks in modelling real world systems Ability to use an efficient algorithm for Deep Models
<b>NAME OF THE SUBJECT:INTRODUCTION TO CRYPTOGRAPHY</b>	
CO1	Provide security of the data over the network.
CO2	Do research in the emerging areas of cryptography and network security.
CO3	Implement various networking protocols.
CO4	Protect any network from the threats in the world.
<b>NAME OF THE SUBJECT:DATA SCIENCE USING CLOUD</b>	
CO1	Understanding the key dimensions of the challenge of Cloud Computing
CO2	Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization
CO3	Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
CO4	Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas
<b>SEM-VI</b>	
<b>NAME OF THE SUBJECT:COMPUTER NETWORKS</b>	
CO1	Understand OSI and TCP/IP models
CO2	Analyze MAC layer and congestion control algorithms understand how internet works
<b>NAME OF THE SUBJECT:WEB TECHNOLOGIES</b>	
CO1	Students are able to develop a dynamic webpage by the use of java script and DHTML.
CO2	Students will be able to write a well formed / valid XML document.
CO3	Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
CO4	Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
CO5	Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.
<b>NAME OF THE SUBJECT:BLOCK CHAIN TECHNOLOGY</b>	
CO1	Explain design principles of Bitcoin and Ethereum, Nakamoto consensus.
CO2	Explain the Simplified Payment Verification protocol.
CO3	List and describe differences between proof-of-work and proof-of-stake consensus.
CO4	Interact with a blockchain system by sending and reading transactions.
CO5	Design, build, and deploy a distributed application.
CO6	Evaluate security, privacy, and efficiency of a given blockchain system.

<b>NAME OF THE SUBJECT: FORMAL LANGUAGES AND AUTOMATA THEORY</b>	
CO1	Classify machines by their power to recognize languages
CO2	Employ finite state machines to solve problems in computing,
CO3	Explain deterministic and non-deterministic machines
CO4	Comprehend the hierarchy of problems arising in the computer science
<b>NAME OF THE SUBJECT: EMBEDDED SYSTEMS</b>	
CO1	Understand the microprocessor architecture and its components used in embedded systems
CO2	Write the 8051 assembly language code for specific purposes
CO3	Implement code for interfacing various devices.
CO4	Develop simple embedded systems for real time operations
CO5	Compose simple embedded system with error free software to obtain target system
<b>NAME OF THE SUBJECT: Cognitive Computing</b>	
CO1	Understand basics of Cognitive Computing and its differences from traditional
CO2	Approaches of Computing. . Plan and use the primary tools associated with cognitive computing
CO3	Plan and execute a project that leverages Cognitive Computing.
<b>NAME OF THE SUBJECT: SOFT COMPUTING</b>	
CO1	Understand soft computing techniques and their role in problem solving.
CO2	Conceptualize and parameterize various problems to be solved through basic soft computing techniques.
CO3	Analyze and integrate various soft computing techniques in order to solve problems effectively and efficiently.
<b>NAME OF THE SUBJECT: EDGE COMPUTING</b>	
CO1	Explore the need for new computing paradigms.
CO2	Explain major components of fog and edge computing architectures.
CO3	Identify potential technical challenges of the transition process and suggest solutions.
CO4	Analyze data and application requirements and pertaining issues.
CO5	Design and model infrastructures.
<b>SEM-VII</b>	
<b>NAME OF THE SUBJECT: DATA VISUALIZATION</b>	
CO1	Understand the fundamental design principles and different types of data visualization.
CO2	Identify both positive and negative impacts of data-informed decision across a variety of domains.
CO3	Apply the fundamental concepts of data visualization to define a project in your field of study.
CO4	Practice the core principles using widely available tools (e.g. Tableau).
CO5	Demonstrate the best practice that presents your story in the process of creating data visualization including connecting to different data sources, assessing to the quality of the data, and converting raw data into data visualizations that provide actionable information.
<b>NAME OF THE SUBJECT: BIG DATA TECHNOLOGIES</b>	

CO1	Illustrate the usage of data on different Big data ecosystems.
CO2	Demonstrate the Pig architecture and evaluation of pig scripts.
CO3	Describe the Hive architecture and execute SQL queries on sample data sets.
CO4	Understand the process of transferring data between different file systems and to execute operations using sqoop.
CO5	Understand the concepts of indexing and use these concepts in solr search engine.
CO6	Implement and evaluate the data manipulation procedures using pig, hive, sqoop and solr. Develop an application using different eco system tools by taking standard sample data set.
<b>NAME OF THE SUBJECT:WEB ANALYTICS</b>	
CO1	Understand the Web analytics
CO2	Identify Different Data Collection and Web Analytics Strategies
CO3	Apply Different Web Analytics Tools
CO4	Summarize Various Google Analytics and testing
<b>NAME OF THE SUBJECT:Ethical Hacking</b>	
CO1	Understand the core foundations of ethics in regards to computer security
CO2	Learn about the hacker mind set and the history of hackers
CO3	Understand basic networking and security technologies
CO4	Gain a basic understanding of security policy
CO5	Learn about basic system defense infrastructure
<b>NAME OF THE SUBJECT:Introduction to cyber forensics</b>	
CO1	Understand the basic terminology of cybercrimes
CO2	Apply a number of different computer forensic tools to a given scenario
CO3	Understand the basics of computer forensics
CO4	Analyze and validate digital evidence data
CO5	Analyze acquisition methods for digital evidence related to system security
<b>NAME OF THE SUBJECT:Natural Language Processing</b>	
CO1	able to understand the wide spectrum of problem statements, tasks, and solution approaches within NLP
CO2	able to implement and evaluate different NLP applications and apply machine learning and deep learning methods for this process.
CO3	Evaluate various algorithms and approaches for the given task, dataset, and stage of the NLP product.
CO4	Understand best practices, opportunities, and the roadmap for NLP from a business and product leader's perspective.
<b>NAME OF THE SUBJECT: Fuzzy Logic</b>	
CO1	understand the basic ideas of fuzzy sets, operations and properties of fuzzy sets and also about fuzzy relations.
CO2	understand the basic features of membership functions, fuzzification process and defuzzification process.
CO3	design fuzzy rule based system.
CO4	know about combining fuzzy set theory with probability to handle random and non-random uncertainty, and the decision making process.

CO5	gain the knowledge about fuzzy C-Means clustering.
<b>NAME OF THE SUBJECT:Semantic web</b>	
CO1	Understand the concept structure of the semantic web technology and how this technology revolutionizes the World Wide Web.
CO2	Understand the concepts of Web Science, semantics of knowledge and resource, ontology.
CO3	Describe logic semantics and inference with OWL.
CO4	Use ontology engineering approaches in semantic applications
CO5	Learn Web graph processing for various applications such as search engine, community detection
CO6	Program web applications and graph processing techniques using Python
<b>NAME OF THE SUBJECT:Cyber security</b>	
CO1	Identifying System and application security threats and vulnerabilities
CO2	Identifying different classes of attacks
CO3	Cyber Security incidents to apply appropriate response
CO4	Describing risk management processes and practices
CO5	Evaluation of decision making outcomes of Cyber Security scenarios
<b>NAME OF THE SUBJECT:Perl programming</b>	
CO1	To identify basic perl constructs and to outline perl debugging commands.
CO2	To create and design simple perl programs with the available perl pre-defined functions.
CO3	To demonstrate perl subroutines and perl references
CO4	To Apply Data Structures on perl programs and perl formats.
CO5	To install HTTP server and to design and execute perl programs through CGI.
<b>NAME OF THE SUBJECT: Distributed systems</b>	
CO1	Develop a familiarity with distributed file systems.
CO2	Describe important characteristics of distributed systems and the salient architectural features of such systems.
CO3	Describe the features and applications of important standard protocols which are used in distributed systems.
CO4	Gaining practical experience of inter-process communication in a distributed environment
<b>NAME OF THE SUBJECT:Green computing</b>	
CO1	Describe the concepts of how to manage the green IT with necessary components.
CO2	Select hardware and software to facilitate more sustainable operation.
CO3	Relate the green computing practices to save energy.
CO4	Find the use of IT in relation to environmental perspectives.
CO5	Explain the issues related with green computing.
CO6	Identify the various laws, standards and protocols for regulating green IT.
<b>NAME OF THE SUBJECT:Angular JS</b>	

CO1	Use operators, variables, arrays, control structures, functions and objects in Java Script.
CO2	Map HTML using the DOM - Document Object Model.
CO3	Use regular expressions for form validation.
CO4	Using Angular JS along with HTML and CSS
<b>NAME OF THE SUBJECT:PROJECT</b>	
CO1	Illustrate the research problem by using acquired knowledge
CO2	Evaluate executable project modules
CO3	Employ latest tools for designing project modules with high accuracy
CO4	Summarize all work through effective team work
CO5	Analyze the testing of project modules
CO6	Evaluate the completed task and focus the project report.
<b>COURSE OUTCOMES - CSM</b>	
<b>SEM-III</b>	
<b>NAME OF THE SUBJECT:DATA STRUCTURES</b>	
CO1	Summarize the properties, interfaces, and behaviors of basic abstract data types
CO2	Discuss the computational efficiency of the principal algorithms for sorting & searching
CO3	Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
CO4	Demonstrate different methods for traversing trees
<b>NAME OF THE SUBJECT:OBJECT ORIENTED PROGRAMMING THROUGH C++</b>	
CO1	Classify object oriented programming and procedural programming
CO2	Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
CO3	Build C++ classes using appropriate encapsulation and design principles
CO4	Apply object oriented or non-object oriented techniques to solve bigger computing problems
<b>NAME OF THE SUBJECT:COMPUTER ORGANIZATION</b>	
CO1	Develop a detailed understanding of computer systems
CO2	Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
CO3	Develop a detailed understanding of architecture and functionality of central processing unit
CO4	Exemplify in a better way the I/O and memory organization
CO5	Illustrate concepts of parallel processing, pipelining and inter processor communication
<b>NAME OF THE SUBJECT: INTRODUCTION TO AI &amp; ML</b>	
CO1	Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
CO2	Formalize a given problem in the language/framework of different AI methods (e.g., a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).



<b>SEM-IV</b>	
<b>NAME OF THE SUBJECT:JAVA PROGRAMMING</b>	
CO1	Able to realize the concept of Object Oriented Programming & Java Programming Constructs
CO2	Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
CO3	Apply the concept of exception handling and Input/ Output operations
CO4	Able to design the applications of Java & Java applet
CO5	Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit
<b>NAME OF THE SUBJECT:DATABASE MANAGEMENT SYSTEMS</b>	
CO1	Describe a relational database and object-oriented database.
CO2	Create, maintain and manipulate a relational database using SQL
CO3	Describe ER model and normalization for database design.
CO4	Examine issues in data storage and query processing and can formulate appropriate solutions.
CO5	Understand the role and issues in management of data such as efficiency, privacy, security, ethical responsibility and Strategic advantage.
CO6	Design and build database system for a given real world problem
<b>NAME OF THE SUBJECT:ANN &amp;FUZZY LOGIC</b>	
CO1	The student will be able evaluate and compare the performance or, other qualities, of algorithms for typical learning problems.
CO2	The student will be able to design a supervised or unsupervised learning system.
<b>NAME OF THE SUBJECT:OPERATING SYSTEMS</b>	
CO1	Describe various generations of Operating System and functions of Operating System
CO2	Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
CO3	Solve Inter Process Communication problems using Mathematical Equations by various methods
CO4	Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement x Techniques
CO5	Outline File Systems in Operating System like UNIX/Linux and Windows
<b>SEM-V</b>	
<b>NAME OF THE SUBJECT:ADVANCED JAVA PROGRAMMING</b>	
CO1	To be familiarize with RMI and JSP
CO2	To understand the Java Servlets and Database connectivity
CO3	To Know more about the Enterprise Java Bean (EJB) Programming
<b>NAME OF THE SUBJECT:SOFTWARE ENGINEERING</b>	
CO1	How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment
CO2	An ability to work in one or more significant application domains

CO3	Work as an individual and as part of a multidisciplinary team to develop and deliver quality software
CO4	Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle
CO5	Demonstrate an ability to use the techniques and tools necessary for engineering practice
<b>NAME OF THE SUBJECT:ML USING TENSOR FLOW</b>	
CO1	The core concepts of Machine Learning, Neural Networks and Deep Learning
CO2	Exploring and pre-processing your data for Machine Learning
CO3	Building your first Neural Network model
CO4	Using Tensor Flow to tackle text classification, image classification and regression problems
CO5	Improving on your models with tuning and error analysis
<b>NAME OF THE SUBJECT:OBJECT ORIENTED ANALYSIS AND DESIGN</b>	
CO1	Ability to find solutions to the complex problems using object oriented approach
CO2	Represent classes, responsibilities and states using UML notation
CO3	Identify classes and responsibilities of the problem domain
<b>NAME OF THE SUBJECT:Ad hoc and sensor networks</b>	
CO1	Explain the concepts, network architectures and applications of ad hoc and wireless sensor networks
CO2	Analyze the protocol design issues of ad hoc and sensor networks
CO3	Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues
CO4	Evaluate the QoS related performance measurements of ad hoc and sensor networks.
<b>NAME OF THE SUBJECT:INTRODUCTION TO DEEP LEARNING</b>	
CO1	Ability to understand the concepts of Neural Networks
CO2	Ability to select the Learning Networks in modeling real world systems Ability to use an efficient algorithm for Deep Models
<b>NAME OF THE SUBJECT:INTRODUCTION TO CRYPTOGRAPHY</b>	
CO1	Provide security of the data over the network.
CO2	Do research in the emerging areas of cryptography and network security.
CO3	Implement various networking protocols.
CO4	Protect any network from the threats in the world.
<b>NAME OF THE SUBJECT:DATA SCIENCE USING CLOUD</b>	
CO1	Understanding the key dimensions of the challenge of Cloud Computing
CO2	Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization
CO3	Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
CO4	Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas
<b>SEM-VI</b>	
<b>NAME OF THE SUBJECT:COMPUTER NETWORKS</b>	
CO1	Understand OSI and TCP/IP models

CO2	Analyze MAC layer and congestion control algorithms understand how internet works
<b>NAME OF THE SUBJECT:WEB TECHNOLOGIES</b>	
CO1	Students are able to develop a dynamic webpage by the use of java script and DHTML.
CO2	Students will be able to write a well formed / valid XML document.
CO3	Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
CO4	Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
CO5	Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.
<b>NAME OF THE SUBJECT:FORMAL LANGUAGES AND AUTOMATA THEORY</b>	
CO1	Classify machines by their power to recognize languages
CO2	Employ finite state machines to solve problems in computing,
CO3	Explain deterministic and non-deterministic machines
CO4	Comprehend the hierarchy of problems arising in the computer science
<b>NAME OF THE SUBJECT:EMBEDDED SYSTEMS</b>	
CO1	Understand the microprocessor architecture and its components used in embedded systems
CO2	Write the 8051 assembly language code for specific purposes
CO3	impliment code for interfacing various devices.
CO4	Develop simple embedded systems for real time operations
CO5	Compose simple embedded system with error free software to obtain target system
<b>NAME OF THE SUBJECT:Cognitive Computing</b>	
CO1	Understand basics of Cognitive Computing and its differences from traditional
CO2	Approaches of Computing. . Plan and use the primary tools associated with cognitive computing
CO3	Plan and execute a project that leverages Cognitive Computing.
<b>NAME OF THE SUBJECT:SOFT COMPUTING</b>	
CO1	Understand soft computing techniques and their role in problem solving.
CO2	Conceptualize and parameterize various problems to be solved through basic soft computing techniques.
CO3	Analyze and integrate various soft computing techniques in order to solve problems effectively and efficiently.
<b>NAME OF THE SUBJECT:EDGE COMPUTING</b>	
CO1	Explore the need for new computing paradigms.
CO2	Explain major components of fog and edge computing architectures.
CO3	Identify potential technical challenges of the transition process and suggest solutions.
CO4	Analyze data and application requirements and pertaining issues.
CO5	Design and model infrastructures.
<b>SEM-VII</b>	

<b>NAME OF THE SUBJECT:DATA VISUALIZATION</b>	
CO1	Understand the fundamental design principles and different types of data visualization.
CO2	Identify both positive and negative impacts of data-informed decision across a variety of domains.
CO3	Apply the fundamental concepts of data visualization to define a project in your field of study.
CO4	Practice the core principles using widely available tools (e.g. Tableau).
CO5	Demonstrate the best practice that presents your story in the process of creating data visualization including connecting to different data sources, assessing to the quality of the data, and converting raw data into data visualizations that provide actionable information.
<b>NAME OF THE SUBJECT:BIG DATA TECHNOLOGIES</b>	
CO1	Illustrate the usage of data on different Big data ecosystems.
CO2	Demonstrate the Pig architecture and evaluation of pig scripts.
CO3	Describe the Hive architecture and execute SQL queries on sample data sets.
CO4	Understand the process of transferring data between different file systems and to execute operations using sqoop.
CO5	Understand the concepts of indexing and use these concepts in solr search engine.
CO6	Implement and evaluate the data manipulation procedures using pig, hive, sqoop and solr. Develop an application using different eco system tools by taking standard sample data set.
<b>NAME OF THE SUBJECT:WEB ANALYTICS</b>	
CO1	Understand the Web analytics
CO2	Identify Different Data Collection and Web Analytics Strategies
CO3	Apply Different Web Analytics Tools
CO4	Summarize Various Google Analytics and testing
<b>NAME OF THE SUBJECT:Ethical Hacking</b>	
CO1	Understand the core foundations of ethics in regards to computer security
CO2	Learn about the hacker mindset and the history of hackers
CO3	Understand basic networking and security technologies
CO4	Gain a basic understanding of security policy
CO5	Learn about basic system defense infrastructure
<b>NAME OF THE SUBJECT:Introduction to cyber forensics</b>	
CO1	Understand the basic terminology of cybercrimes
CO2	Apply a number of different computer forensic tools to a given scenario
CO3	Understand the basics of computer forensics
CO4	Analyze and validate digital evidence data
CO5	Analyze acquisition methods for digital evidence related to system security
<b>NAME OF THE SUBJECT:Natural Language Processing</b>	
CO1	able to understand the wide spectrum of problem statements, tasks, and solution approaches within NLP

CO2	able to implement and evaluate different NLP applications and apply machine learning and deep learning methods for this process.
CO3	Evaluate various algorithms and approaches for the given task, dataset, and stage of the NLP product.
CO4	Understand best practices, opportunities, and the roadmap for NLP from a business and product leader's perspective.
<b>NAME OF THE SUBJECT: Fuzzy Logic</b>	
CO1	understand the basic ideas of fuzzy sets, operations and properties of fuzzy sets and also about fuzzy relations.
CO2	understand the basic features of membership functions, fuzzification process and defuzzification process.
CO3	design fuzzy rule based system.
CO4	know about combining fuzzy set theory with probability to handle random and non-random uncertainty, and the decision making process.
CO5	gain the knowledge about fuzzy C-Means clustering.
<b>NAME OF THE SUBJECT: Semantic web</b>	
CO1	Understand the concept structure of the semantic web technology and how this technology revolutionizes the World Wide Web.
CO2	Understand the concepts of Web Science, semantics of knowledge and resource, ontology.
CO3	Describe logic semantics and inference with OWL.
CO4	Use ontology engineering approaches in semantic applications
CO5	Learn Web graph processing for various applications such as search engine, community detection
CO6	Program web applications and graph processing techniques using Python
<b>NAME OF THE SUBJECT: Cyber security</b>	
CO1	Identifying System and application security threats and vulnerabilities
CO2	Identifying different classes of attacks
CO3	Cyber Security incidents to apply appropriate response
CO4	Describing risk management processes and practices
CO5	Evaluation of decision making outcomes of Cyber Security scenarios
<b>NAME OF THE SUBJECT: Perl programming</b>	
CO1	To identify basic perl constructs and to outline perl debugging commands.
CO2	To create and design simple perl programs with the available perl pre-defined functions.
CO3	To demonstrate perl subroutines and perl references
CO4	To Apply Data Structures on perl programs and perl formats.
CO5	To install HTTP server and to design and execute perl programs through CGI.
<b>NAME OF THE SUBJECT: Distributed systems</b>	
CO1	Develop a familiarity with distributed file systems.
CO2	Describe important characteristics of distributed systems and the salient architectural features of such systems.
CO3	Describe the features and applications of important standard protocols which are used in distributed systems.
CO4	Gaining practical experience of inter-process communication in a distributed environment

<b>NAME OF THE SUBJECT:Green computing</b>	
CO1	Describe the concepts of how to manage the green IT with necessary components.
CO2	Select hardware and software to facilitate more sustainable operation.
CO3	Relate the green computing practices to save energy.
CO4	Find the use of IT in relation to environmental perspectives.
CO5	Explain the issues related with green computing.
CO6	Identify the various laws, standards and protocols for regulating green IT.
<b>NAME OF THE SUBJECT:Angular JS</b>	
CO1	Use operators, variables, arrays, control structures, functions and objects in Java Script.
CO2	Map HTML using the DOM - Document Object Model.
CO3	Use regular expressions for form validation.
CO4	Using Angular JS along with HTML and CSS
<b>NAME OF THE SUBJECT:PROJECT</b>	
CO1	Illustrate the research problem by using acquired knowledge
CO2	Evaluate executable project modules
CO3	Employ latest tools for designing project modules with high accuracy
CO4	Summarize all work through effective team work
CO5	Analyze the testing of project modules
CO6	Evaluate the completed task and focus the project report.
<b>COURSE OUTCOMES - CSD</b>	
<b>SEM-III</b>	
<b>NAME OF THE SUBJECT:DATA STRUCTURES</b>	
CO1	Summarize the properties, interfaces, and behaviors of basic abstract data types
CO2	Discuss the computational efficiency of the principal algorithms for sorting & searching
CO3	Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
CO4	Demonstrate different methods for traversing trees
<b>NAME OF THE SUBJECT:OBJECT ORIENTED PROGRAMMING THROUGH C++</b>	
CO1	Classify object oriented programming and procedural programming
CO2	Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
CO3	Build C++ classes using appropriate encapsulation and design principles
CO4	Apply object oriented or non-object oriented techniques to solve bigger computing problems
<b>NAME OF THE SUBJECT:COMPUTER ORGANIZATION</b>	
CO1	Develop a detailed understanding of computer systems

CO2	Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
CO3	Develop a detailed understanding of architecture and functionality of central processing unit
CO4	Exemplify in a better way the I/O and memory organization
CO5	Illustrate concepts of parallel processing, pipelining and inter processor communication
<b>NAME OF THE SUBJECT:INTRODUCTION TO DATA SCIENCE</b>	
CO1	Describe what Data Science is and the skill sets needed to be a data scientist
CO2	Explain the significance of exploratory data analysis (EDA) in data science
CO3	Ability to learn the supervised learning, SVM
CO4	Apply basic machine learning algorithms (Linear Regression)
CO5	Explore the Networks, PageRank
<b>SEM-IV</b>	
<b>NAME OF THE SUBJECT:JAVA PROGRAMMING</b>	
CO1	Able to realize the concept of Object Oriented Programming & Java Programming Constructs
CO2	Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
CO3	Apply the concept of exception handling and Input/ Output operations
CO4	Able to design the applications of Java & Java applet
CO5	Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit
<b>NAME OF THE SUBJECT:DATABASE MANAGEMENT SYSTEMS</b>	
CO1	Describe a relational database and object-oriented database.
CO2	Create, maintain and manipulate a relational database using SQL
CO3	Describe ER model and normalization for database design.
CO4	Examine issues in data storage and query processing and can formulate appropriate solutions.
CO5	Understand the role and issues in management of data such as efficiency, privacy, security, ethical responsibility and Strategic advantage.
CO6	Design and build database system for a given real world problem
<b>NAME OF THE SUBJECT:Data Mining</b>	
CO1	To fully understand standard data mining methods and techniques such as association rules, data clustering and classification.
CO2	Learn new, advanced techniques for emerging applications (e.g. social network analysis, stream data mining).
CO3	Gain practical intuition about how to apply these techniques on datasets of realistic sizes using modern data analysis frameworks.
<b>NAME OF THE SUBJECT:OPERATING SYSTEMS</b>	
CO1	Describe various generations of Operating System and functions of Operating System
CO2	Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
CO3	Solve Inter Process Communication problems using Mathematical Equations by various methods
CO4	Compare various Memory Management Schemes especially paging and Segmentation in

	Operating System and apply various Page Replacement x Techniques
CO5	Outline File Systems in Operating System like UNIX/Linux and Windows
<b>SEM-V</b>	
<b>NAME OF THE SUBJECT:ADVANCED JAVA PROGRAMMING</b>	
CO1	To be familiarize with RMI and JSP
CO2	To understand the Java Servlets and Database connectivity
CO3	To Know more about the Enterprise Java Bean (EJB) Programming
<b>NAME OF THE SUBJECT:SOFTWARE ENGINEERING</b>	
CO1	How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment
CO2	An ability to work in one or more significant application domains
CO3	Work as an individual and as part of a multidisciplinary team to develop and deliver quality software
CO4	Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle
CO5	Demonstrate an ability to use the techniques and tools necessary for engineering practice
<b>NAME OF THE SUBJECT:BIG DATA ANALYTICS</b>	
CO1	Understand Big Data and its analytics in the real world
CO2	Analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics
CO3	Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm
CO4	Design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics
CO5	Implement Big Data Activities using Hive
<b>NAME OF THE SUBJECT:OBJECT ORIENTED ANALYSIS AND DESIGN</b>	
CO1	Ability to find solutions to the complex problems using object oriented approach
CO2	Represent classes, responsibilities and states using UML notation
CO3	Identify classes and responsibilities of the problem domain
<b>NAME OF THE SUBJECT:Ad hoc and sensor networks</b>	
CO1	Explain the concepts, network architectures and applications of ad hoc and wireless sensor networks
CO2	Analyze the protocol design issues of ad hoc and sensor networks
CO3	Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues
CO4	Evaluate the QoS related performance measurements of ad hoc and sensor networks.
<b>NAME OF THE SUBJECT:INTRODUCTION TO DEEP LEARNING</b>	
CO1	Ability to understand the concepts of Neural Networks
CO2	Ability to select the Learning Networks in modeling real world systems Ability to use an efficient algorithm for Deep Models
<b>NAME OF THE SUBJECT:INTRODUCTION TO CRYPTOGRAPHY</b>	
CO1	Provide security of the data over the network.



CO2	Do research in the emerging areas of cryptography and network security.
CO3	Implement various networking protocols.
CO4	Protect any network from the threats in the world.
<b>NAME OF THE SUBJECT:DATA SCIENCE USING CLOUD</b>	
CO1	Understanding the key dimensions of the challenge of Cloud Computing
CO2	Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization
CO3	Assessing the financial, technological, and organizational capacity of employer’s for actively initiating and installing cloud-based applications.
CO4	Assessment of own organizations’ needs for capacity building and training in cloudcomputing-related IT areas
<b>SEM-VI</b>	
<b>NAME OF THE SUBJECT:COMPUTER NETWORKS</b>	
CO1	Understand OSI and TCP/IP models
CO2	Analyze MAC layer and congestion control algorithms understand how internet works
<b>NAME OF THE SUBJECT:WEB TECHNOLOGIES</b>	
CO1	Students are able to develop a dynamic webpage by the use of java script and DHTML.
CO2	Students will be able to write a well formed / valid XML document.
CO3	Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
CO4	Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
CO5	Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.
<b>NAME OF THE SUBJECT:FORMAL LANGUAGES AND AUTOMATA THEORY</b>	
CO1	Classify machines by their power to recognize languages
CO2	Employ finite state machines to solve problems in computing,
CO3	Explain deterministic and non-deterministic machines
CO4	Comprehend the hierarchy of problems arising in the computer science
<b>NAME OF THE SUBJECT:EMBEDDED SYSTEMS</b>	
CO1	Understand the microprocessor architecture and its components used in embedded systems
CO2	Write the 8051 assembly language code for specific purposes
CO3	impliment code for interfacing various devices.
CO4	Develop simple embedded systems for real time operations
CO5	Compose simple embedded system with error free software to obtain target system
<b>NAME OF THE SUBJECT:Cognitive Computing</b>	
CO1	Understand basics of Cognitive Computing and its differences from traditional
CO2	Approaches of Computing. . Plan and use the primary tools associated with cognitive computing
CO3	Plan and execute a project that leverages Cognitive Computing.

<b>NAME OF THE SUBJECT:SOFT COMPUTING</b>	
CO1	Understand soft computing techniques and their role in problem solving.
CO2	Conceptualize and parameterize various problems to be solved through basic soft computing techniques.
CO3	Analyze and integrate various soft computing techniques in order to solve problems effectively and efficiently.
<b>NAME OF THE SUBJECT:EDGE COMPUTING</b>	
CO1	Explore the need for new computing paradigms.
CO2	Explain major components of fog and edge computing architectures.
CO3	Identify potential technical challenges of the transition process and suggest solutions.
CO4	Analyze data and application requirements and pertaining issues.
CO5	Design and model infrastructures.
<b>SEM-VII</b>	
<b>NAME OF THE SUBJECT:DATA VISUALIZATION</b>	
CO1	Understand the fundamental design principles and different types of data visualization.
CO2	Identify both positive and negative impacts of data-informed decision across a variety of domains.
CO3	Apply the fundamental concepts of data visualization to define a project in your field of study.
CO4	Practice the core principles using widely available tools (e.g. Tableau).
CO5	Demonstrate the best practice that presents your story in the process of creating data visualization including connecting to different data sources, assessing to the quality of the data, and converting raw data into data visualizations that provide actionable information.
<b>NAME OF THE SUBJECT:BIG DATA TECHNOLOGIES</b>	
CO1	Illustrate the usage of data on different Big data ecosystems.
CO2	Demonstrate the Pig architecture and evaluation of pig scripts.
CO3	Describe the Hive architecture and execute SQL queries on sample data sets.
CO4	Understand the process of transferring data between different file systems and to execute operations using sqoop.
CO5	Understand the concepts of indexing and use these concepts in solr search engine.
CO6	Implement and evaluate the data manipulation procedures using pig, hive, sqoop and solr. Develop an application using different eco system tools by taking standard sample data set.
<b>NAME OF THE SUBJECT:WEB ANALYTICS</b>	
CO1	Understand the Web analytics
CO2	Identify Different Data Collection and Web Analytics Strategies
CO3	Apply Different Web Analytics Tools
CO4	Summarize Various Google Analytics and testing
<b>NAME OF THE SUBJECT:Ethical Hacking</b>	
CO1	Understand the core foundations of ethics in regards to computer security
CO2	Learn about the hacker mindset and the history of hackers
CO3	Understand basic networking and security technologies

C04	Gain a basic understanding of security policy
C05	Learn about basic system defense infrastructure
<b>NAME OF THE SUBJECT:Introduction to cyber forensics</b>	
C01	Understand the basic terminology of cybercrimes
C02	Apply a number of different computer forensic tools to a given scenario
C03	Understand the basics of computer forensics
C04	Analyze and validate digital evidence data
C05	Analyze acquisition methods for digital evidence related to system security
<b>NAME OF THE SUBJECT:Natural Language Processing</b>	
C01	able to understand the wide spectrum of problem statements, tasks, and solution approaches within NLP
C02	able to implement and evaluate different NLP applications and apply machine learning and deep learning methods for this process.
C03	Evaluate various algorithms and approaches for the given task, dataset, and stage of the NLP product.
C04	Understand best practices, opportunities, and the roadmap for NLP from a business and product leader's perspective.
<b>NAME OF THE SUBJECT: Fuzzy Logic</b>	
C01	understand the basic ideas of fuzzy sets, operations and properties of fuzzy sets and also about fuzzy relations.
C02	understand the basic features of membership functions, fuzzification process and defuzzification process.
C03	design fuzzy rule based system.
C04	know about combining fuzzy set theory with probability to handle random and non-random uncertainty, and the decision making process.
C05	gain the knowledge about fuzzy C-Means clustering.
<b>NAME OF THE SUBJECT:Semantic web</b>	
C01	Understand the concept structure of the semantic web technology and how this technology revolutionizes the World Wide Web.
C02	Understand the concepts of Web Science, semantics of knowledge and resource, ontology.
C03	Describe logic semantics and inference with OWL.
C04	Use ontology engineering approaches in semantic applications
C05	Learn Web graph processing for various applications such as search engine, community detection
C06	Program web applications and graph processing techniques using Python
<b>NAME OF THE SUBJECT:Cyber security</b>	
C01	Identifying System and application security threats and vulnerabilities
C02	Identifying different classes of attacks
C03	Cyber Security incidents to apply appropriate response
C04	Describing risk management processes and practices
C05	Evaluation of decision making outcomes of Cyber Security scenarios
<b>NAME OF THE SUBJECT:Perl programming</b>	

CO1	To identify basic perl constructs and to outline perl debugging commands.
CO2	To create and design simple perl programs with the available perl pre-defined functions.
CO3	To demonstrate perl subroutines and perl references
CO4	To Apply Data Structures on perl programs and perl formats.
CO5	To install HTTP server and to design and execute perl programs through CGI.

**NAME OF THE SUBJECT:Distributed systems**

CO1	Develop a familiarity with distributed file systems.
CO2	Describe important characteristics of distributed systems and the salient architectural features of such systems.
CO3	Describe the features and applications of important standard protocols which are used in distributed systems.
CO4	Gaining practical experience of inter-process communication in a distributed environment

**NAME OF THE SUBJECT:Green computing**

CO1	Describe the concepts of how to manage the green IT with necessary components.
CO2	Select hardware and software to facilitate more sustainable operation.
CO3	Relate the green computing practices to save energy.
CO4	Find the use of IT in relation to environmental perspectives.
CO5	Explain the issues related with green computing.
CO6	Identify the various laws, standards and protocols for regulating green IT.

**NAME OF THE SUBJECT:Angular JS**

CO1	Use operators, variables, arrays, control structures, functions and objects in Java Script.
CO2	Map HTML using the DOM - Document Object Model.
CO3	Use regular expressions for form validation.
CO4	Using Angular JS along with HTML and CSS

**NAME OF THE SUBJECT:PROJECT**

CO1	Illustrate the research problem by using acquired knowledge
CO2	Evaluate executable project modules
CO3	Employ latest tools for designing project modules with high accuracy
CO4	Summarize all work through effective team work
CO5	Analyze the testing of project modules
CO6	Evaluate the completed task and focus the project report.

**COURSE OUTCOMES - CBA**

**SEM-III**

**NAME OF THE SUBJECT:DATA STRUCTURES**

CO1	Summarize the properties, interfaces, and behaviors of basic abstract data types
-----	--

CO2	Discuss the computational efficiency of the principal algorithms for sorting & searching
CO3	Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
CO4	Demonstrate different methods for traversing trees
<b>NAME OF THE SUBJECT:OBJECT ORIENTED PROGRAMMING THROUGH C++</b>	
CO1	Classify object oriented programming and procedural programming
CO2	Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
CO3	Build C++ classes using appropriate encapsulation and design principles
CO4	Apply object oriented or non-object oriented techniques to solve bigger computing problems
<b>NAME OF THE SUBJECT:COMPUTER ORGANIZATION</b>	
CO1	Develop a detailed understanding of computer systems
CO2	Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
CO3	Develop a detailed understanding of architecture and functionality of central processing unit
CO4	Exemplify in a better way the I/O and memory organization
CO5	Illustrate concepts of parallel processing, pipelining and inter processor communication
<b>NAME OF THE SUBJECT:INTRODUCTION TO DATA SCIENCE</b>	
CO1	Describe what Data Science is and the skill sets needed to be a data scientist
CO2	Explain the significance of exploratory data analysis (EDA) in data science
CO3	Ability to learn the supervised learning, SVM
CO4	Apply basic machine learning algorithms (Linear Regression)
CO5	Explore the Networks, PageRank
<b>SEM-IV</b>	
<b>NAME OF THE SUBJECT:JAVA PROGRAMMING</b>	
CO1	Able to realize the concept of Object Oriented Programming & Java Programming Constructs
CO2	Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
CO3	Apply the concept of exception handling and Input/ Output operations
CO4	Able to design the applications of Java & Java applet
CO5	Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit
<b>NAME OF THE SUBJECT:DATABASE MANAGEMENT SYSTEMS</b>	
CO1	Describe a relational database and object-oriented database.
CO2	Create, maintain and manipulate a relational database using SQL
CO3	Describe ER model and normalization for database design.
CO4	Examine issues in data storage and query processing and can formulate appropriate solutions.

CO5	Understand the role and issues in management of data such as efficiency, privacy, security, ethical responsibility and Strategic advantage.
CO6	Design and build database system for a given real world problem
<b>NAME OF THE SUBJECT:Data Mining</b>	
CO1	To fully understand standard data mining methods and techniques such as association rules, data clustering and classification.
CO2	Learn new, advanced techniques for emerging applications (e.g. social network analysis, stream data mining).
CO3	Gain practical intuition about how to apply these techniques on datasets of realistic sizes using modern data analysis frameworks.
<b>NAME OF THE SUBJECT:OPERATING SYSTEMS</b>	
CO1	Describe various generations of Operating System and functions of Operating System
CO2	Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
CO3	Solve Inter Process Communication problems using Mathematical Equations by various methods
CO4	Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement x Techniques
CO5	Outline File Systems in Operating System like UNIX/Linux and Windows
<b>SEM-V</b>	
<b>NAME OF THE SUBJECT:ADVANCED JAVA PROGRAMMING</b>	
CO1	To be familiarize with RMI and JSP
CO2	To understand the Java Servlets and Database connectivity
CO3	To Know more about the Enterprise Java Bean (EJB) Programming
<b>NAME OF THE SUBJECT:SOFTWARE ENGINEERING</b>	
CO1	How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment
CO2	An ability to work in one or more significant application domains
CO3	Work as an individual and as part of a multidisciplinary team to develop and deliver quality software
CO4	Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle
CO5	Demonstrate an ability to use the techniques and tools necessary for engineering practice
<b>NAME OF THE SUBJECT:BIG DATA ANALYTICS</b>	
CO1	Understand Big Data and its analytics in the real world
CO2	Analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics
CO3	Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm
CO4	Design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics
CO5	Implement Big Data Activities using Hive
<b>NAME OF THE SUBJECT:OBJECT ORIENTED ANALYSIS AND DESIGN</b>	
CO1	Ability to find solutions to the complex problems using object oriented approach

CO2	Represent classes, responsibilities and states using UML notation
CO3	Identify classes and responsibilities of the problem domain
<b>NAME OF THE SUBJECT:Ad hoc and sensor networks</b>	
CO1	Explain the concepts, network architectures and applications of ad hoc and wireless sensor networks
CO2	Analyze the protocol design issues of ad hoc and sensor networks
CO3	Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues
CO4	Evaluate the QoS related performance measurements of ad hoc and sensor networks.
<b>NAME OF THE SUBJECT:INTRODUCTION TO DEEP LEARNING</b>	
CO1	Ability to understand the concepts of Neural Networks
CO2	Ability to select the Learning Networks in modeling real world systems Ability to use an efficient algorithm for Deep Models
<b>NAME OF THE SUBJECT:INTRODUCTION TO CRYPTOGRAPHY</b>	
CO1	Provide security of the data over the network.
CO2	Do research in the emerging areas of cryptography and network security.
CO3	Implement various networking protocols.
CO4	Protect any network from the threats in the world.
<b>NAME OF THE SUBJECT:DATA SCIENCE USING CLOUD</b>	
CO1	Understanding the key dimensions of the challenge of Cloud Computing
CO2	Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization
CO3	Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
CO4	Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas
<b>SEM-VI</b>	
<b>NAME OF THE SUBJECT:COMPUTER NETWORKS</b>	
CO1	Understand OSI and TCP/IP models
CO2	Analyze MAC layer and congestion control algorithms understand how internet works
<b>NAME OF THE SUBJECT:WEB TECHNOLOGIES</b>	
CO1	Students are able to develop a dynamic webpage by the use of java script and DHTML.
CO2	Students will be able to write a well formed / valid XML document.
CO3	Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
CO4	Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
CO5	Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.
<b>NAME OF THE SUBJECT:FORMAL LANGUAGES AND AUTOMATA THEORY</b>	
CO1	Classify machines by their power to recognize languages
CO2	Employ finite state machines to solve problems in computing,

CO3	Explain deterministic and non-deterministic machines
CO4	Comprehend the hierarchy of problems arising in the computer science
<b>NAME OF THE SUBJECT:EMBEDDED SYSTEMS</b>	
CO1	Understand the microprocessor architecture and its components used in embedded systems
CO2	Write the 8051 assembly language code for specific purposes
CO3	impliment code for interfacing various devices.
CO4	Develop simple embedded systems for real time operations
CO5	Compose simple embedded system with error free software to obtain target system
<b>NAME OF THE SUBJECT:Cognitive Computing</b>	
CO1	Understand basics of Cognitive Computing and its differences from traditional
CO2	Approaches of Computing. . Plan and use the primary tools associated with cognitive computing
CO3	Plan and execute a project that leverages Cognitive Computing.
<b>NAME OF THE SUBJECT:SOFT COMPUTING</b>	
CO1	Understand soft computing techniques and their role in problem solving.
CO2	Conceptualize and parameterize various problems to be solved through basic soft computing techniques.
CO3	Analyze and integrate various soft computing techniques in order to solve problems effectively and efficiently.
<b>NAME OF THE SUBJECT:EDGE COMPUTING</b>	
CO1	Explore the need for new computing paradigms.
CO2	Explain major components of fog and edge computing architectures.
CO3	Identify potential technical challenges of the transition process and suggest solutions.
CO4	Analyze data and application requirements and pertaining issues.
CO5	Design and model infrastructures.
<b>SEM-VII</b>	
<b>NAME OF THE SUBJECT:DATA VISUALIZATION</b>	
CO1	Understand the fundamental design principles and different types of data visualization.
CO2	Identify both positive and negative impacts of data-informed decision across a variety of domains.
CO3	Apply the fundamental concepts of data visualization to define a project in your field of study.
CO4	Practice the core principles using widely available tools (e.g. Tableau).
CO5	Demonstrate the best practice that presents your story in the process of creating data visualization including connecting to different data sources, assessing to the quality of the data, and converting raw data into data visualizations that provide actionable information.
<b>NAME OF THE SUBJECT:BIG DATA TECHNOLOGIES</b>	
CO1	Illustrate the usage of data on different Big data ecosystems.
CO2	Demonstrate the Pig architecture and evaluation of pig scripts.
CO3	Describe the Hive architecture and execute SQL queries on sample data sets.



CO4	Understand the process of transferring data between different file systems and to execute operations using sqoop.
CO5	Understand the concepts of indexing and use these concepts in solr search engine.
CO6	Implement and evaluate the data manipulation procedures using pig, hive, sqoop and solr. Develop an application using different eco system tools by taking standard sample data set.
<b>NAME OF THE SUBJECT:WEB ANALYTICS</b>	
CO1	Understand the Web analytics
CO2	Identify Different Data Collection and Web Analytics Strategies
CO3	Apply Different Web Analytics Tools
CO4	Summarize Various Google Analytics and testing
<b>NAME OF THE SUBJECT:Ethical Hacking</b>	
CO1	Understand the core foundations of ethics in regards to computer security
CO2	Learn about the hacker mindset and the history of hackers
CO3	Understand basic networking and security technologies
CO4	Gain a basic understanding of security policy
CO5	Learn about basic system defense infrastructure
<b>NAME OF THE SUBJECT:Introduction to cyber forensics</b>	
CO1	Understand the basic terminology of cybercrimes
CO2	Apply a number of different computer forensic tools to a given scenario
CO3	Understand the basics of computer forensics
CO4	Analyze and validate digital evidence data
CO5	Analyze acquisition methods for digital evidence related to system security
<b>NAME OF THE SUBJECT:Natural Language Processing</b>	
CO1	able to understand the wide spectrum of problem statements, tasks, and solution approaches within NLP
CO2	able to implement and evaluate different NLP applications and apply machine learning and deep learning methods for this process.
CO3	Evaluate various algorithms and approaches for the given task, dataset, and stage of the NLP product.
CO4	Understand best practices, opportunities, and the roadmap for NLP from a business and product leader's perspective.
<b>NAME OF THE SUBJECT: Fuzzy Logic</b>	
CO1	understand the basic ideas of fuzzy sets, operations and properties of fuzzy sets and also about fuzzy relations.
CO2	understand the basic features of membership functions, fuzzification process and defuzzification process.
CO3	design fuzzy rule based system.
CO4	know about combining fuzzy set theory with probability to handle random and non-random uncertainty, and the decision making process.
CO5	gain the knowledge about fuzzy C-Means clustering.
<b>NAME OF THE SUBJECT:Semantic web</b>	
CO1	Understand the concept structure of the semantic web technology and how this technology revolutionizes the World Wide Web.

C02	Understand the concepts of Web Science, semantics of knowledge and resource, ontology.
C03	Describe logic semantics and inference with OWL.
C04	Use ontology engineering approaches in semantic applications
C05	Learn Web graph processing for various applications such as search engine, community detection
C06	Program web applications and graph processing techniques using Python
<b>NAME OF THE SUBJECT: Cyber security</b>	
C01	Identifying System and application security threats and vulnerabilities
C02	Identifying different classes of attacks
C03	Cyber Security incidents to apply appropriate response
C04	Describing risk management processes and practices
C05	Evaluation of decision making outcomes of Cyber Security scenarios
<b>NAME OF THE SUBJECT: Perl programming</b>	
C01	To identify basic perl constructs and to outline perl debugging commands.
C02	To create and design simple perl programs with the available perl pre-defined functions.
C03	To demonstrate perl subroutines and perl references
C04	To Apply Data Structures on perl programs and perl formats.
C05	To install HTTP server and to design and execute perl programs through CGI.
<b>NAME OF THE SUBJECT: Distributed systems</b>	
C01	Develop a familiarity with distributed file systems.
C02	Describe important characteristics of distributed systems and the salient architectural features of such systems.
C03	Describe the features and applications of important standard protocols which are used in distributed systems.
C04	Gaining practical experience of inter-process communication in a distributed environment
<b>NAME OF THE SUBJECT: Green computing</b>	
C01	Describe the concepts of how to manage the green IT with necessary components.
C02	Select hardware and software to facilitate more sustainable operation.
C03	Relate the green computing practices to save energy.
C04	Find the use of IT in relation to environmental perspectives.
C05	Explain the issues related with green computing.
C06	Identify the various laws, standards and protocols for regulating green IT.
<b>NAME OF THE SUBJECT: Angular JS</b>	
C01	Use operators, variables, arrays, control structures, functions and objects in Java Script.
C02	Map HTML using the DOM - Document Object Model.
C03	Use regular expressions for form validation.

CO4	Using Angular JS along with HTML and CSS
<b>NAME OF THE SUBJECT:PROJECT</b>	
CO1	Illustrate the research problem by using acquired knowledge
CO2	Evaluate executable project modules
CO3	Employ latest tools for designing project modules with high accuracy
CO4	Summarize all work through effective team work
CO5	Analyze the testing of project modules
CO6	Evaluate the completed task and focus the project report.