B.Tech in Computer Science and Engineering

S.No	Course Code	Courses	L	T	P	C
		I YEAR I SEMESTER				
1	BS1101	Mathematics-I	3	0	0	3
2	HS1101	Communicative English	3	0	0	3
3	BS1102	Applied Chemistry	3	0	0	3
4	ES1101	Essential of Electrical & Electronics Engineering	3	0	0	3
5	ES1102	Engineering Drawing	1	0	3	2.5
6	HS1102	English Communication Skills Lab-I	0	0	2	1
7	BS1103	Applied Chemistry Lab	0	0	3	1.5
8	ES1103	IT workshop	0	0	2	1
9	ES1104	Essential of Electrical & Electronics Engineering Lab	0	0	2	1
10	MC1101	Environment Science	3	0	0	0
11	MC1102	Physical Fitness Activities	2	0	0	0
		Total	18	0	12	19

B.Tech in Computer Science and Engineering

R19BS1101   **Mathematics-I**

Course Outcomes:
- Utilize mean value theorems to real life problems   L3
- Solve the differential equations related to various engineering fields   L3
- Familiarize with functions of several variables which is useful in optimization   L3
- Apply double integration techniques in evaluating areas bounded by region   L3
- Students will also learn important tools of calculus in higher dimensions.
- Students will become familiar with 2-dimensional and 3-dimemensional coordinate systems
            L5
- Conclude the use of special function in multiple integrals   L4

R19HS1101   **Communicative English**

Course Outcomes:
- Understand social or transactional dialogues spoken by native speakers of E English and identify the context, topic, and pieces of specific information
- Ask and answer general questions on familiar topics and introduce oneself/others
- Employ suitable strategies for skimming and scanning to get the general ideas of a text and locate specific information
- Recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- From sentences using proper grammatical structures and correct word forms

R19BS1102   **Applied Chemistry**

Course Outcomes:
- Outline the properties of polymers and various additives added and different methods of forming plastic materials
- Explain the preparation, properties and applications of some plastic materials
- Interpret the mechanism of conduction in conducting polymers
- Discuss natural and synthetic rubbers and their applications

B.Tech in Computer Science and Engineering

R19ES1101   **Essential of Electrical & Electronics Engineering**

Course Outcomes:
The student should be able to:
- Analyse various electrical networks.
- Understand operation of DC generators,3-point   starter and DC machine testing by Swinburne's Test.
- Analyse performance of single-phase transformer.
- Explain   operation of 3-phase alternator and 3-phase induction motors.
- Analyse operation of half wave, full wave bridge rectifiers and OP-AMPs and Explain single stage CE amplifier and concept of feedback amplifier

R19ES1102   **Engineering Drawing**

Course outcomes:
- After undergoing this course, the student learnt the scales, various engineering curves and drawings the 2D and 3D objects

R19HS1102   **English Communication Skills Lab-I**
                     Applied Chemistry Lab
Course Outcomes:
- The students enter into the professional course have practically very little exposure to lab classes.
- The experiments introduce volumetric analysis: redox titrations with different indicators;
- EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis.
- Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments.They thus acquire some experimental skills

R19ES1103   **IT workshop**

                Essential of Electrical & Electronics Engineering Lab
Course Outcomes:
The student should be able to:
- Compute the efficiency of DC shunt machine without actual loading of the machine
- Estimate the efficiency and regulation at different load conditions and power factors for single phase transformer with OC and SC tests.
- Analyse the performance characteristics and to determine efficiency o f DC shunt motor & 3-phase induction motor.
- Pre-determine the regulation of an alternator by synchronous impedance method.
- Control the speed of DC shunt motors using Armature voltage and Field flux control methods

- Draw the characteristics of PN junction diode & transistor
- Determine the ripple factor of half wave &full wave rectifiers

R19BS1201   **Mathematics-II**

Course outcomes:

At the end of the course, the student will be able to

- Develop the use of matrix algebra techniques that is needed by engineers for practical applications   L6
- Solve system of linear algebraic equations using Gauss Elimination ,Gauss Jordan, Gauss Seidel   L3
- Evaluate approximating the roots of polynomial and transcendental equations by different algorithmsL5
- Apply Newton's forward &backward interpolation and Lagrange's formulate for equal and unequal intervals   L3
- Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations   L3

R19BS1202   **Mathematics-III**

Course outcomes:

At the end of the course, the student will be able to

- Interpret the physical meaning of different operators such as gradient, curl and divergence L5
- Estimate the work done against a field, circulation and flux using vector calculus
       L5
- Apply the Laplace transform for solving different equations   L3
- Find or compute the Fourier series of periodic signals   L3
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms   L3
- Identify solution methods for partial differential equations that model physical processes L3

R19BS1203   **Applied Physics**

Course outcomes:

The student will be able to

- Explain the need of coherent sources and the conditions for sustained interference
- Analyze the differences between interface and diffraction with applications
- Illustrate the resolving power of various optical instruments
- Explain the fundamental concepts of quantum mechanics
- Analyze the physical significance of wave function
- Apply Schrödinger's wave equation for energy values of a free particle

- Explain the various electron theories
- Calculate the Fermi energy
- Interpret the effects of temperature on Fermi Dirac DISTRIBUTION FUNCTION
- Summarise various types of solids based on band theory
- Classify the energy bands of semiconductors
- Outline the properties of n-type and p-type semiconductors
- Identify the type of semiconductor using Hall effect
- Explain the concept of polarization in dielectric materials
- Summarize various types of polarization of dielectric
- Interpret Lorentz field and Claussius- Mosotti relation in dielectrics
- Classify the magnetic materials based on susceptibility and their temperature dependence
- Explain the applications of dielectric and magnetic materials
- Apply the concept of magnetism to magnetic devices

R19ES1201   **Problem Solving and Programming Using C**

Course outcome:
After completion of this course
- Student will be able to develop efficient algorithm for solving a problem
- Use various constructs of C programming language efficiently
- Student will be able to develop programs using modular approach such as functions and also able to develop program s to perform matrix and mathematical applications
- Student will be able to understand dynamic memory management and problems using pointers and solving the problems
- Student will be able to develop programs for real life applications using structures and also learn about handling the files for storing the data permanently

R19ES1202   **Digital Logic Design**
Course Outcomes:
After the course the student will be able to:
- Understand number systems and codes
- Solve Boolean expressions using Minimization methods.
- Design the sequential and combinational circuits.

- Apply state reduction methods to solve sequential circuits.

R19ES1203   **Problem Solving and Programming Using C Lab**

Course Outcomes:
- Develop efficient algorithm for solving a problem.
- Experiment with various constructs of C programming language efficiently.
- Develop programs using modular approach such as functions and also able to develop programs to perform matrix and mathematical applications.
- Examine dynamic memory management, problems using pointers and solving the problems.
- Develop programs for real-life applications using Structures and also learn about handling the files for storing the data permanently.

R19HS1202   **Engineering Exploration Project – Design Thinking**
Constitution of India

CO1: Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.   K6

CO2: Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.   K6

CO3: Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.   K6

CO4: Discuss the passage of the Hindu Code Bill of1956. K6

R19PCC2101   **MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**

CO1   Student will be able to demonstrate skills in solving mathematical problems   K2

CO2   Student will be able to comprehend mathematical principles and logic   K4

CO3   Student will be able to demonstrate knowledge of mathematical modelling and proficiency in using mathematical software   K6

CO4   Student will be able to manipulate and analyze data numerically and/or graphically using appropriate Software   K3

CO5   Student will be able to communicate effectively mathematical ideas/results verbally or in writing K3

R19PCC2102   **SOFTWARE ENGINEERING**

Course Outcomes: At the end of the course, student will be able to

- Demonstrate software process, various models and Agile methodologies
- Develop a software project from Requirement Analysis and Planning
- Make use of design process, concepts and tools for engineering practice
- Examine various coding and testing techniques in real time applications of quality maintenance
- Acquire and develop many valuable skills such as the ability to use computer aided software and reuse components

R19PCC2103   **OOPS THROUGH JAVA**

Course Outcomes: At the end of the course, student will be able to

- Understands the use of OOP concepts
- Apply OOP concepts to solve real world problems
- Develop multithreaded programs using synchronization concept.
- Understands the concept of packages and exception handling mechanism.
- Design GUI based applications using AWT and Swings

R19PCC2104   **DATA STRUCTURES THROUGH C**

Course Outcomes: By the end of the course student will be able to understand

- Select appropriate data structures as applied to specified problem definition
- Summarize and understand the practical applications of several advanced techniques like Hashing
- Demonstrate the operations such as Insertion, Deletion and Search on Data structures like Binary Search Tree and AVL trees and solve the problems
- Demonstrate the operations such as Insertion, Deletion and Search on Advanced Data structures like Heaps, AVL trees and comparisons of trees like Red Black trees and B-Trees etc.
- Analyzing and Implement appropriate sorting/searching technique for given problem and Graph algorithms

R19ES2101   **COMPUTER ORGANIZATION**

- Demonstrate the architecture of a modern computer.
- Analyze the performance of a computer using performance equation.
- Organize and determine the different types of instructions.
- Determine the   effective address of   an operand by addressing modes.
- Evaluate the arithmetic operation of positive and negative numbers.
-

R19ES2102   **COMPUTER GRAPHICS**

Course Outcomes: After learning the course, the student will be able:
- Acquire the basics of computer graphics, different graphics systems and applications of computer graphics with various algorithms for line, circle and ellipse drawing objects for 2D transformations
- Explain projections and visible surface detection techniques for display of 3D scene on 2D screen
- Develop scene with basic graphic primitive algorithms using OPENGL programming.
- Explain selected among models for lighting/shading: Color, ambient light; distant and light with sources; Phong reflection model; and shading (flat, smooth, Gourand, Phong).
- Illustrate able to create the general software architecture of programs that use 3D object sets with computer graphics.

R19PCC2105   **OOP THROUGH JAVA LAB**
- Apply OOP concepts to solve real world problems
- Implement programs to distinguish different forms of inheritance
- Create packages and to reuse them
- Develop multithreaded program using synchronization concepts
- Design GUI based applications using AWT and Swings

R19PCC2106   **DATA STRUCTURES THROUGH C LAB**
Course Outcomes: After the completion of the course, student will be able to
- Implement basic operations such as Insertion, Deletion, and Search on Advanced Data structures like Heaps, AVL trees, and B-Trees
- Understand the practical applications of several advanced techniques like Hashing, Data compression techniques, and spanning trees in the domains of DBMS, Compiler design, and in Network routing.
- Identify the appropriate data structure for the given problem definition
- Apply advanced concepts and data structures to improve the efficiency of real time systems

R19MC2102   **Employability Skills-I**

COURSE OUTCOMES: The end of the course student will be able to
- Understand the corporate etiquette.
- Make representations effectively with appropriate body language
- Be composed with positive attitude
- Understand the core competencies to succeed in professional and personal life

R19PCC2201   **WEB TECHNOLOGIES**

Course Outcomes:
- Understand the basic concepts of HTML and CSS & apply those concepts to design static web pages.
- Identify and understand various concepts related to dynamic web pages and validate them using JavaScript
- Outline the concepts of Extensible markup language &AJAX
- Develop web Applications using ScriptingLanguages & Frameworks
- Create and deploy secure, usable database driven web applications using PHP and RUBY

R19PCC2202   **OPERATING SYSTEMS**

Course Outcomes:
- Describe the important computer system resources and the role of operating system in their management policies and algorithms.
- Understand the process management policies and scheduling of processes by CPU
- Evaluate the requirement for process synchronization and coordination handled by operating system
- Describe and analyze the memory management and its allocation policies.
- Identify use and evaluate the storage management policies with respect to different storage management technologies.

R19PCC2203   **DATA BASE MANAGEMENT SYSTEMS**

Course Outcomes: At the end of the course the student will be able to:

- Illustrate the concept of databases, database management systems, database languages, database structures and their work
- Apply ER modeling and Relational modeling for designing simple databases.

- Summarize the concepts related to relational model and SQL and Write database queries using relational algebra and structured query language.
- Design and develop databases from the real world by applying the concepts of Normalization.
- Outline the issues associated with Transaction Management and Recovery, Tree Structured and Hash-Based Indexing

R19PCC2204
FORMAL LANGUAGE AND AUTOMATA THEORY
Course Outcomes: By the end of the course students can
- Classify machines by their power to recognize languages.
- Attains the knowledge of language classes & grammars relationship among them with the help of Chomsky hierarchy
- Employ finite state machines to solve problems in computing
- Explain deterministic and non-deterministic machines
- Comprehend the hierarchy of problems arising in the computer science

R19PCC2205
OPERATING SYSTEM & LINUX LAB
Course Outcomes: At the end of the course, student will be able to
CO1   Build various CPU scheduling algorithms and compare results   K6
CO2   Design various disk scheduling algorithms and compare results   K6
CO3   Implement page replace algorithms   K6
CO4   Develop various file allocation strategies   K4
CO5   Execute basic Linux commands and basic shell scriptsK2

R19PCC2206
WEB TECHNOLOGIES LAB
Course Outcomes:
CO1   Understand, analyze and apply the role of languages like HTML, CSS, XML.   K3
CO2   Review JavaScript, PHP and protocols in the workings of the web and web applications

                                                                          K2
CO3   Recommend of Web Application Terminologies, Internet Tools, E – Commerce and other
        Web services.   K5
CO4   Develop and Analyze dynamic Web Applications using PHP & MySql   K6
CO5   Installing & Using Frameworks.   K6

R19PCC2207
DATABASE MANAGEMENT SYSTEMS LAB
Course Outcomes: At the end of the course the student will be able to:
CO1   Utilize SQL to execute queries for creating database and performing data manipulation
operations   K3
CO2   Examine integrity constraints to build efficient databases   K4
CO3   Apply Queries using Advanced Concepts of SQL   K3
CO4   Build PL/SQL programs including stored procedures, functions, cursors and triggers.
        K6

R19PCC3101
DATA WAREHOUSING AND DATA MINING
COURSE OUTCOMES:
CO1   Illustrate the importance of Data Warehousing, Data Mining and its functionalities.
        K2
CO2   Demonstrate on various Data Preprocessing Techniques viz. data
cleaning, data integration, data transformation and data reduction   K2
CO3   Choose   appropriate   classification   technique   to   perform
classification, model building and evaluation.   K3
CO4   Make use of association rule mining techniques viz. Apriori and FP
Growth algorithms and analyze on frequent item sets generation.   K4
CO5   Identify and apply various clustering algorithm (with open source
tools), interpret, evaluate and report the result.   K3

R19PCC3102
Computer Networks
Course Outcomes (COs): At the end of the course, student will be able to
CO1 Demonstrate different network models for networking links OSI, TCP/IP get knowledge
about
        various communication techniques, methods and protocol standards. K2
CO2 Discuss different transmission media and different switching networks.   K6
CO3 Analyze data link layer services, functions and protocols like HDLC and PPP.   K4

CO4 Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD,
     CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols.   K4

CO5 Determine application layer services and client server protocols working with the client server

     paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.   K5

R19PCC3103
COMPILER DESIGN

Course Outcomes: At the end of the course, student will be able to

CO1   Ability to design, implement a compiler for any language using lex and yacc tools.
       K2

CO2   Able to develop Top Down and Bottom Up Parsing and LL(1) grammars. K3

CO3   Able to design and implement LL and LR parsers.   K3

CO4   Able to design algorithms to perform SDD's and Inter Mediate Code Generations.
       K4

CO5   Ability to design algorithms to generate   Storage Organization, machine Dependent and

       Independent Optimization   K3

R19PCC3104
Artificial Intelligence

Course Outcomes (COs): At the end of the course, student will be able to

CO1 Discuss the fundamental concepts in Artificial Intelligence   K4

CO2 Analyze the applications of search strategies and problem reductions. K6

CO3 Apply the mathematical logic concepts   K4

CO4 Develop the Knowledge representations in Artificial Intelligence   K4

CO5 Explain the Fuzzy logic systems   K5

R19PE3101a
PRINCIPLES OF PROGRAMMING LANGUAGE

CO1   Describe the syntax and semantics of programming languages and gain practical
       Knowledge in lexical analysis and parsing phases of a compiler
       K4

CO2   Make use of different constructs in programming languages with merits and demerits
       K3

CO3   Design and implement sub programs in various programming languages
       K5

CO4   Developing the knowledge on different programming language features like object-orientation,

concurrency, exception handling and event handling
K3
CO5   Analyzing functional paradigm and ability to write small programs using Scheme and ML

Develop programs logic paradigm and ability to write small programs using Prolog
K6

R19PE3101
DIGITAL IMAGE PROCESSING PE3101
Course Outcomes (COs): At the end of the course, student will be able to
CO1   Demonstrate the basics and fundamentals of digital image processing, such as
       digitization, sampling, quantization, and 2D-transforms   K4
CO2   Analyze & Operate on images using the techniques of smoothing, sharpening and
       enhancement.   K6
CO3   Apply Image restoration concepts and filtering techniques   K4
CO4   Illustrate the basics of Image segmentation   K4
CO5   Apply Image Compression and Recognition techniques   K3

R19PE3101c
ADVANCED UNIX PROGRAMMING
Course Outcomes (COs): At the end of the course, student will be able to
CO1 Know about the Unix commands K1
CO2 Analyze of shell programming   K6
CO3 Apply Know about different system calls for files and directories K4
CO4   Illustrate the basics working of processes and signals   K4
CO5   Apply the Application of client server program for IPC   K4

R19PE3101d
ADVANCED   COMPUTER ARCHITECTURE
Course Outcomes(COs): At the end of the course, student will be able to
CO1   Understand the advanced concepts of computer architecture.(Knowledge and
       understanding)
                                                                        K2
CO2   Compare and contrast the parallel architectures   K2, K4,K5
CO3   Illustrate parallel programming concepts   K2, K3
CO4   Investigate modern design structures of Pipelined and Multiprocessors systems.   K4
CO5   Acquainted with recent computer architectures and I/O devices, as well as the low-level
       language required to drive/manage these types of advanced hardware.   K6
CO6   Identify the limitations of ILP.   K2

R19PE3101e
OBJECT ORIENTED ANALYSIS AND DESIGN

Course Outcomes(COs): At the end of the course, student will be able to

CO1	Explain the Inherent Complexity of Software	K2
CO2	Identify classes and responsibilities of the problem domain	K2, K4,K5
CO3	Represent classes, responsibilities and states using UML notation	K2, K3
CO4	Ability to find solutions to the complex problems using object oriented approach	K4

R19PCC3105
COMPUTER NETWORKS & COMPILER DESIGN LAB

Course Outcomes (COs): At the end of the course, student will be able to

CO1	Analyze performance of various communication protocols.	K4
CO2	Practice packet /file transmission between nodes.	K3
CO3	Construct error detecting and correcting codes.	K5
CO4	Develop programs for data transfer between nodes using Routing algorithms.	K6
CO5	Develop Top Down and Bottom Up Parsing and LL grammars.	K5
CO6	Design and implement LL and LR parsers.	K6

R19PCC3107
DATA WAREHOUSING AND DATA MINING LAB

COURSE OUTCOMES:

CO1   Design a data mart or data warehouse for any organization K6

CO2   Extract knowledge using data mining techniques   K2

CO3   Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification, clustering.   K2

CO4   Analyze on knowledge flow application on data sets K3

R19PR3101a

B.Tech in Computer Science and Engineering

SOCIALLY RELEVANT PROJECTS

Employability skills-II

Course Outcomes: After completion of this course

CO1   Solve various Basic Mathematics problems by following different methods
          K3

CO2   Follow strategies in minimizing time consumption in problem solving Apply shortcut methods
          to solve problems
          K2

CO3   Confidently solve any mathematical problems and utilize these mathematical skills both in their
          professional as well as personal life.
          K3

CO4   Analyze, summarize and present information in quantitative forms including table, graphs and
          formulas
          K4

MACHINE LEARNING USING PYTHON

Course Outcomes: After the completion of the course, student will be able to

CO1   Explain the definition and usage of the term 'the internet of things' in different contexts.
          K2

CO2   Demonstrate on various network protocols used in IoT.
          K2

CO3   Analyze on various key wireless technologies used in IoT systems, such as WiFi, 6LoWPAN, Bluetooth and ZigBee.
          K4

CO4   Illustrate on the role of big data, cloud computing and data analytics in IoT system.
          K5

CO5   Design a simple IoT system made up of sensors, wireless network connection, data analytics
          and display/actuators, and write the necessary control software.
          K6

B.Tech in Computer Science and Engineering

R19PCC3202

DESIGN AND ANALYSIS OF ALGORITHMS

Course Outcomes (COs): At the end of the course, student will be able to

CO1 Analyze the performance of a given algorithm, denote its time complexity using

the asymptotic notation for recursive and non- recursive algorithms and apply graph search algorithms to real world problems

K1

CO2 List and describe various algorithmic approaches and Solve problems using

divide and conquer & greedy Method

K3

CO3 Apply dynamic programming to real world problem

K2

CO4 Organize backtracking, branch and bound algorithmic approaches

K6

CO5 Demonstrate NP- Completeness theory ,lower bound theory and String

Matching   K6

Universal Human Values 2: Understanding Harmony

OUTCOME OF THE COURSE:

By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

This is only an introductory foundational input. It would be desirable to follow it up by

a) faculty-student or mentor-mentee programs throughout their time with the
   institution

b) Higher level courses on human values in every aspect of living. E.g. as a
   professional

R19PE3201b

OPERATION RESEARCH

CO1   Describe clearly a problem, identify its parts and analyze the individual functions   K1

CO2   Perform Feasibility study for solving an optimization problem   K3

B.Tech in Computer Science and Engineering

CO3   Become a mathematical translation of the verbal formulation of an optimization
        problem   K2
CO4   Design algorithms, the repetitive use of which will lead reliably to finding an
        approximate solution   K6
CO5   Discover, study and solve optimization problems   K6
CO6   Investigate, study, develop, organize and promote innovative solutions for various
        applications K3

R19PE3201c
ADVANCED COMPUTER NETWORKS

CO1   Student learns routing algorithms and different congestion control methods in networking.   K2
CO2   Students Learns IPV4 and IPV6 protocol Formats and how these protocols used to deliver data
        packets from source to destination.   K4
CO3   Students Learns different Transport Layer protocol formats of TCP, UDP and SCTP for packet
        delivery at Transport Layer.. K3
CO4   Students Learns the concepts Wireless LANS, IEEE 802.11, and Satellite networks.
        K6
CO5   Students Learn the emerging trends of networks-MANETS,WSN and their applications.
        K2

R19PE3201d
MOBILE APPLICATION DEVELOPMENT
Course Outcomes: At the end of this course, students will be able to:
- Install and configure Android application development tools.
- Design and develop user Interfaces for the Android platform.
- Save state information across important operating system events.
- Apply Java programming concepts to Android application development.

R19PE3201e
DISTRIBUTED SYSTEMS

CO1   Discuss about System Models   K6
CO2   How to know External Data Representation and Marshalling   K1
CO3   Explain the Operating System Architecture   K3

CO4   Demonstrate Service Architecture   K6
CO5   Identify the Concurrency Control in Distributed Transactions   K3

R19PE3202a
Software Project Management
CO1   Apply the process to be followed in the software development life-cycle models.   K3
CO2   Apply the concepts of project management & planning. Implement the project plans through managing people, communications and change.   K3
CO3   Conduct activities necessary to successfully complete and close the Software projects.   K2
CO4   Implement communication, modeling, and construction & deployment practices in software development.   K6
CO5   Illustrate Life Cycle Expectations Pragmatic Software   K6

R19PE3202b
NETWORK PROGRAMMING
CO1   Explain OSI Reference Model   K3
CO2   Demonstrate the I/O Multiplexing & IPV6 Socket option   K5
CO3   Describe the TCP Echo server functions   K4
CO4   Analyze the UDP Echo server function   K5
CO5   Identify the Server Binding, Authentication K3

R19PE3202c
DESIGN PATTERNS
CO1   Create software designs that are scalable and easily maintainable   K1
CO2   Develop creational design patterns in software design for class instantiation   K4
CO3   Illustrate structural design patterns for better class and object composition K5
CO4   Describe behavioral patterns for better organization and communication   K4
CO5   Make Use of behavioral patterns for better organization and communication between the objects K2

R19PCC3203
MACHINE LEARNING USING PYTHON LAB
CO1   Implement procedures for the machine learning algorithms K4
CO2   Design Python programs for various Learning algorithms   K6
CO3   Apply appropriate data sets to the Machine Learning algorithms   K3
CO4   Identify and apply Machine Learning algorithms to solve real world problems K2

R19PCC3204
DATA ANALYTICS USING R LAB

B.Tech in Computer Science and Engineering

CO1   Familiarity with the R programming language and the RStudio development environment Implement basic concepts   of R programming, and its
different module that includes conditional, looping, lists, Strings, Functions, Frames, Arrays, and File programming   K2, K6

CO2   Hands-on experience using various basic data formats and
file types in R K2, K6

CO3   Experience using basic statistical analysis tools in R to analyze data sets   K3, K4

CO4   Extend the functionality of R by using add-on packages   K2

CO5   Use R Graphics and Tables to visualize results of various
statistical operations on data   K3

R19PCC4101

CRYPTOGRAPHY AND NETWORK SECURITY

CO1   Student will be able to understand security issues related to computer networks and learn different symmetric key techniques   K2

CO2   Students will be able learn mathematic of cryptography for symmetric and Asymmetric algorithms and apply this knowledge to understand the Cryptographic algorithms K3

CO3   Students will be able learn different types of symmetric and Asymmetric algorithms   K3

CO4   Students will be able learn different algorithms of Hash functions, message authentication and digital signature and their importance to the security   K4

CO5   Students will be able learn different Enhanced security protocols of Application Layer, Transport Layer and Network layer   K4

R19PCC4102

BIG DATA ANALYTICS

CO1   Preparing for data summarization, query, and analysis.   K2

CO2   Applying data modelling techniques to large data sets   K3

CO3   Creating applications for Big Data analytics. K3

CO4   Building a complete business data analytic solution K4

R19PE4101a

MOBILE COMPUTING

CO1   Interpret Wireless local area networks (WLAN): MAC design principles, 802.11 WIFI   K2

CO2   Discuss fundamental challenges in mobile communications and potential Techniques in GSM   K6

CO3   Demonstrate Mobile IP in Network layer   K5
CO4   Elaborate TCP/IP Protocols and database issues   K4
CO5   Illustrate different data delivery methods and synchronization protocols   K5

R19PE4101b
MEAN STACK DEVELOPMENT

CO1   Identify the Basic Concepts of Web   &Markup Languages. K3
CO2   Develop web Applications using Scripting Languages & Frameworks.   K3
CO3   Make use of Express JS and Node JS frameworks   K3
CO4   Illustrate the uses of web services concepts like restful, react js.   K2
CO5   Adapt to Deployment Techniques & Working with cloud platform. K6

R19PE4101d
INTERNET OF THINGS

CO1   Interpret the impact and challenges posed by IoT networks leading to new architectural models.   K1
CO2   Compare and contrast the deployment of smart objects and the technologies to connect them to
        network.   K2
CO3   Appraise the role of IoT protocols for efficient network communication.   K3
CO4   Elaborate the need for Data Analytics and Security in IoT.   K4
CO5   Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.   K5

R19PE4101e
PARALLEL COMPUTING

CO1   How to design the parallel algorithms for real world problems   K1
CO2   Explain wide variety of parallel architectures.   K3
CO3   Describe and implement the parallel algorithms on available parallel Systems   K4
CO4   Develop and design algorithms suited for multiprocessor systems using MPI And OpenMP.   K5
CO5   Analyze the parallel algorithms.   K5

R19PE4102a
CLOUD COMPUTING

CO1   Explain different types of ComputingK3
CO2   Illustrate Four types of Cloud Deployment Models   K4
CO3   Demonstrate different Phases of Cloud Migration Approaches
for Cloud Migration   K5
CO4   Analyze and Develop Cloud Service ModelsK3
CO5   Describe Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud   K4

R19PE4102b

SOCIAL NETWORKS & SEMANTIC WEB

CO1   Demonstrate social network analysis and measures. K2
CO2   Analyze random graph models and   navigate social networks data K4
CO3   Apply the network topology and Visualization tools.   K3
CO4   Analyze the experiment with small world models and clustering models.   K4
CO5   Compare the application driven virtual communities from social network Structure. K5

R19PE4102c

AD-HOC & SENSOR NETWORKS

CO1   Demonstrate the Concepts, Network Architecture and Applications of Ad-hoc and Wireless Sensor Networks   K5
CO2   Analyze the protocol design issues of Ad-hoc Networks   K4
CO3   Make use of the the design of routing protocols for ad-hoc and wireless networks.   K2
CO4   Develop   the   Concepts,   Architecture   of   ad-hoc and sensor networks and MAC layer protocols.   K4
CO5   Evaluate the QOS related performance measurements of ad-hoc and sensor networks K5

R19PE4102d

CYBER SECURITY & FORENSICS

CO1   Enumerate the computer forensics fundamentals   K2
CO2   Describe the types of computer forensics technology   K4
CO3   Analyze various computer forensics systems K4
CO4   Illustrate the methods for data recovery, evidence collection and data seizure   K5
CO5   Identify the Role of CERT-In Security   K3
BIG DATA ANALYTICS LAB

R19PE4201d

DEEP LEARNING TECHNIQUES

CO1   Demonstrate the basic concepts fundamental learning techniques and layers.   K2
CO2   Discuss the Neural Network training, various random models.   K6
CO3   Explain different types of deep learning network models.   K5
CO4   Classify the Probabilistic Neural Networks. K2

CO5   Implement tools on Deep Learning techniques.   K3

R19PE4201e

NEURAL NETWORKS & SOFT COMPUTING

CO1   Elaborate fuzzy logic and reasoning to handle uncertainty in engineering problems. K6

CO2   Make use of genetic algorithms to combinatorial optimization problems   K3

CO3   Distinguish   artificial   intelligence   techniques,   including   search   heuristics, knowledge representation, planning and reasoning.   K4

CO4   Formulate and apply the principles of self-adopting and self organizing neuro fuzzy inference systems.   K6

CO5   Evaluate and compare solutions by various soft computing approaches for a given problem K5

R19PE4202c

WIRELESS NETWORK SECURITY

CO1   Explain the Threats   in networks and provide Authentication to real time problems. K2

CO2   identify and investigate in-depth bothearly and contemporary threats to wireless networks security   K3

CO3   Ability to analyze and determine for any organization the database security requirements and appropriate solutions   K4

CO4   Explain IP Security Issues and solve real time problems.   K2

CO5   List the Basic specifications in Bluetooth Security. K1

R19PE4202d

B.Tech in Computer Science and Engineering

ETHICAL HACKING

CO1   Ability to understand the concepts of Ethical Hacking and Penetration Testing   K5

CO2   Analyze the information gathering techniques like Footprinting, social Engineering attacks and it'scountermeasures.   K4

CO3   Analyze the concepts of Scanning and Enumeration K4

CO4   Demonstrate the Web Hacking techniques and protecting the system from being attacked K2

CO5   Elaborate the concepts of password cracking techniques and Steganography   K6

R19PE4202e

DIGITAL MARKETING

CO1   Demonstrate the applications of digital marketing in the globalized market   K6

CO2   Apply Channels of Digital MarketingK3

CO3   Organize digital marketing plan   K5

CO4   Analyze Search engine marketing   K4

CO5   Make use of Online Advertising   K2

\

OPEN ELECTIVES TO BE OFFERED BY
CSE FOR OTHER BRANCHES

R19OE3201A

DATA STRUCTURES

CO1   Select appropriate data structures as applied to specified problem definition   K5

CO2   Summarize and understand the practical applications of several advanced techniques like Hashing and Analyzing and Implement appropriate sorting/searching technique for given problems   K2

CO3   Demonstrate the operations such as Insertion, Deletion and Search on Data structures like Binary Search Tree and solve the problems   K3

CO4   Demonstrate the operations such as Insertion, Deletion and Search on Advanced Data structures like Heaps, AVL trees and B Trees.   K3

CO5   Comparisons of trees like Red Black trees and B-Trees etc. and priority queue operations. K4

R19OE3201B

B.Tech in Computer Science and Engineering

JAVA PROGRAMMING

CO1   Discuss and understand java programming constructs, Control structures   K2
CO2   Illustrate and experiment Object Oriented Concepts like classes, objects   K3
CO3   Apply Object Oriented Constructs such as Inheritance, interfaces, and exception handling K3
CO4   Construct applications using multithreading and I/O K3
CO5   Develop Dynamic User Interfaces using applets and Event Handling in java   K3

R19OE3201C
DATA BASE MANAGEMENT SYSTEMS

CO1   Illustrate the concept of databases, database management systems, database languages, database structures and their work   K2
CO2   Apply ER modeling and Relational modeling for designing simple databases.   K3
CO3   Summarize the concepts related to relational model and SQL and Write database queries using relational algebra and structured query language.   K2
CO4   Design and develop databases from the real world by applying the concepts of Normalization.   K6
CO5   Outline the issues associated with Transaction Management and Recovery, Tree Structured Indexing   K2

R19OE3201D
COMPUTER GRAPHICS

CO1   Acquire the basics of computer graphics, different graphics systems and applications of computer graphics with various algorithms for line, circle and ellipse drawing objects for 2D transformations   K3
CO2   Explain projections and visible surface detection techniques for display of 3D scene on 2D screen   K5
CO3   Develop scene with basic graphic primitive algorithms using OPENGL programming.   K3
CO4   Know and be able to Explain selected among models for lighting/shading: Color, ambient light; distant and light with sources; Phong reflection model; and shading (flat, smooth, Gourand, Phong)..   K5
CO5   Illustrate able to create the general software architecture of programs that use 3D object sets with computer graphics   K3

R19OE3201E
C++ PROGRAMMING

CO1   Demonstrate basics of object oriented mode, differences between conventional and oops programming, the top-down and bottom-up approach I/O streams in C++   K2

CO2   Explain Write, compile and debug programs and Use different data types, classes, objects and member functions in C++ language.   K5

CO3   Make use of Basic concept in C++ programming, Operators, control structures, functions, overloading, and recursion.   K5

CO4   Build dynamic memory management techniques using pointers, constructors, destructors, virtual functions.   K5

CO5   Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.   K3

R19OE3201F
STIMULATION & MODELING

CO1   Analyze Computer simulation needs, and to implement and test a variety of simulation and data analysis K2

CO2   Build tools to view and control simulations and their results K6

CO3   Provide a strong foundation on concept of simulation, and modeling.   K3

CO4   Design simulation models for various case studies like inventory, traffic flow networks, etc.
          K4

CO5   Practice on simulation tools and impart knowledge on building simulation systems. K3,K5

R19PE4101A
OPERATING SYSTEMS

CO1   Describe Computer Operating System Functions, Structures and System Calls.   K1

CO2   Demonstrate various Process Management Concepts and CPU Scheduling Algorithms and Process Synchronization Techniques.   K3

CO3   Illustrate Memory Management Techniques and Page Replacement Algorithms.   K2

CO4   Apply Deadlock Prevention and Avoidance Techniques   K3

CO5   Demonstrate File System Concepts and Mass Storage Structures   K3

R19PE4101B
PYTHON PROGRAMMING

CO1   Describe comprehend the basics of python programming..   K1

CO2   Demonstrate the principles of structured programming and be able to describe, design, implement, and test structured programs using currently accepted methodology..   K3

CO3   Explain the use of the built-in data structures list, sets, tuples and dictionary.   K2

CO4   Make use of functions and its applications   K3

CO5   Identify real-world applications using oops, files and exception handling provided by python K3

R19PE4101C

B.Tech in Computer Science and Engineering

WEB TECHNOLOGIES

CO1   Describe basics of Web Designing using HTML, DHTML, and CSS   K2
CO2   Build real world applications using client side and server side scripting languages K3
CO3   Design and develop applications using web servers K5
CO4   Analyze the basics of PHP programming   K4
CO5   Apply Database connectivity with case study for student Information System and Health Management system   K3

R19PE4101D
SOFT COMPUTING

CO1   Able to apply fuzzy logic and reasoning to handle uncertainty in engineering problems.   K2
CO2   Make use of genetic algorithms to combinatorial optimization problems   K3
CO3   Apply artificial intelligence techniques, including search heuristics, knowledge representation, planning and reasoning.   K5
CO4   Learn and apply the principles of self adopting and self organizing neuro fuzzy inference systems   K4
CO5   Evaluate and compare solutions by various soft computing approaches for a given problemK3

R19PE4101E
DISTRIBUTED COMPUTING

CO1   Explain the fundamentals of Distributed Computing K2
CO2   Identify an Message communication process K3
CO3   Briefly explain uses of RPC Model in a system   K3
CO4   Design and Implementation issues of DSM   K6
CO5   Compare the relationship between Clock Synchronization, Algorithms   K2

R19PE4101F
AI and ML for Robotics
CO1   Explain the History of AI - Agents - Structure of Intelligent agents K5
CO2   Design agents for any given problem K3
CO3   Describe Represent real world knowledge using first order or propositional logic   K6
CO4   To make use of Solve problems by appropriated using the supervised or unsupervised machine learning algorithms K5
CO5   Develop appropriate clustering algorithm for solving real-world problems K4
BIG DATA ANALYTICS

B.Tech in Computer Science and Engineering

CO1 Understand how to leverage the insights from big data analytics   K2
CO2 Analyze data by utilizing various statistical and data mining approaches   K3
CO3 Perform analytics on real-time streaming data   K3
CO4 Understand the various NoSql alternative database models   K4

R19OE4201B
AI TOOLS & TECHNIQUES

CO1 Explain the fundamentals of AI and machine learning   K2
CO2 Identify an appropriate AI problem solving method and knowledge representation techniqueK3
CO3 Identify appropriate machine learning models for problem solving K3
CO4 Design and develop the AI applications in real world scenario   K6
CO5 Compare the relationship between AI, ML, and Deep Learning   K2

R19OE4201C
IMAGE PROCESSING

CO1 Demonstrate the components of image processing   K2
CO2 Explain various filtration techniques. K5
CO3 Apply image compression techniques.   K3
CO4 Discuss the concepts of wavelet transforms. K6
CO5 Analyze the concept of morphological image processing.   K4

R19OE4201D
INFORMATION SECURITY

CO1 Evaluate the OSI Security Architecture and Security Services   K2
CO2 Demonstrate basic principles of Block Cipher and RSA   K5
CO3 Evaluate the Cryptographic Hash Functions, MAC's and Digital Signature.   K2
CO4 Demonstrate how to IP Security more secure then Transport Level Security   K3
CO5 Evaluate System security policies and procedures   K5

R19OE4201E
MOBILE APPLICATION DEVELOPMENT

CO1   Install and configure Android application development tools.   K2
CO2   Design and develop user Interfaces for the Android platform.   K5
CO3   Save state information across important operating system events.   K2
CO4   Apply Java programming concepts to Android application development.   K3
CO5   Design and Implement Packaging and Deploying, Performance Best Practices   K5

R19OE4201F
SENSOR NETWORKS

CO1   Explain the concepts of sensor networks   K3
CO2   Illustrate the MAC and transport protocols for adhoc networks   K4
CO3   Demonstrate the security of sensor networks K5
CO4   Analyze and Develop Sensor Service Models   K3
CO5   Design the applications of adhoc and sensor networks   K4