K.L.N. COLLEGE OF ENGINEERING

Pottapalayam, Sivagangai District

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Estd: 1994

SECOND YEAR

CURRICULUM AND SYLLABUS

REGULATIONS 2020

For Under Graduate Program

B.E. COMPUTER SCIENCE AND ENGINEERING (IoT)

CHOICE BASED CREDIT SYSTEM

(For the students admitted in the academic year 2023-2024)

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM

(An Autonomous Institution, Affiliated to Anna University, Chennai)

VISION OF THE INSTITUTION

To become a Centre of Excellence in Technical Education and Research in producing Competent and Ethical professionals to the society.

MISSION OF THE INSTITUTION

To impart Value and Need based curriculum to the students with enriched skill development in the field of Engineering, Technology, Management and Entrepreneurship and to nurture their character with social concern and to pursue their career in the areas of Research and Industry**.**

VISION OF THE DEPARTMENT

To evolve in the field of Computer Science & Engineering through sustainable technical education with innovative research and to foster competent professionals to serve and lead the society.

MISSION OF THE DEPARTMENT

- Imparting demand based proficient education through quality teaching – learning process in tune with the interdisciplinary needs of global work environment.
- Inculcating the attitude of continuous learning through industry institution interaction, consultancy and research activities.
- Cultivating professionalism, ethics and integrity of character for positive contributions to society.

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PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO I Contribute effectively to the society by applying principles of Computer Science and Engineering for analyzing the real world problems to produce optimal and sustainable technical solutions.

PEO II Sustain as good professionals by pursuing career / advanced studies and practice innovation in emerging technologies and current trends through lifelong learning.

PEO III Build professionalism, team work, effective communication, ethical values and leadership qualities**.**

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1 Ability to apply good analytical, design and implementation skills to formulate and solve scientific and business applications pertaining to Algorithms, Computer Systems, Networks, Security, Data Analytics and Artificial Intelligence.

PSO2 Ability to update knowledge continuously in various domains like Virtualization, Mobile Application Development, Data Visualization, Machine Learning and Technologies like Storage, Computing, Communication to meet the industry requirements.

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PROGRAM OUTCOMES

Computer Science and Engineering (IoT) Graduates will be able to:

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM
(An Autonomous Institution, Affiliated to Anna University, Chennai)

REGULATIONS 2020

For Under Graduate Program

B.E. COMPUTER SCIENCE AND ENGINEERING (IoT)

CHOICE BASED CREDIT SYSTEM

CATEGORY OF COURSES

i. **Humanities and Social Sciences (HS) Courses** include Technical English, Environmental Science and Engineering, Engineering Ethics and human values, Communication Skills and Management courses.

ii. **Basic Sciences (BS**) **Courses** include Mathematics, Physics, and Chemistry.

iii. **Engineering Sciences (ES) Courses** include Engineering Practices, Engineering Graphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering / Instrumentation etc.

iv. **Professional Core (PC) Courses** include the core courses relevant to the chosen programme of study.

v. **Professional Elective (PE) Courses** include the elective courses relevant to the chosen programme of study.

vi. **Open Elective (OE) Courses** include courses from other departments which a student can choose from the list specified in the curriculum of the students B.E. / B.Tech. Programmes.

vii. **Employability Enhancement Courses (EEC)** include Project Work and/or Internship, Seminar, Professional Practices, Case Study and Industrial/Practical Training.

viii. **Mandatory Courses (MC)** include Personality and Character development and the courses recommended by the regulatory bodies such as AICTE, UGC, etc

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM – 630 612

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B.E. COMPUTER SCIENCE AND ENGINEERING (IOT)

REGULATIONS – 2020

CURRICULUM AND SYLLABUS

SEMESTER III

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	20BS303	Discrete Mathematics	BS#	4	3	1	0	4
2	20IT301	Object Oriented Programming **(Common to B.Tech. IT, B.Tech. AIDS, CSE (CS) & CSE(IOT) programmes)**	PC	3	3	0	0	3
3	20CS302	Data Structures and Algorithms	PC	3	3	0	0	3
4	20CI301	Sensors and Microcontrollers	PC	3	3	0	0	3
5	20HS301	Universal Human Values **(Common to all B.E./B.Tech programmes)**	HS	3	2	1	0	3
THEORY CUM PRACTICAL								
6	20CI302	Digital Principles and System Design	PC	5	3	0	2	4
PRACTICAL								
7	20CS3L2	Data Structures and Algorithms Laboratory	PC#	4	0	0	4	2
8	20CS3L3	Object Oriented Programming Laboratory	PC#	4	0	0	4	2
TOTAL				**29**	**17**	**2**	**10**	**24**

SEMESTER IV

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	20BS403	Probability, Statistics and Queuing Theory **(Common to B.E CSE , CSE (CS) & CSE(IOT) programmes)**	BS	4	3	1	0	4
2	20CS402	Database Management Systems	PC#	3	3	0	0	3
3	20CS501	Computer Networks	PC#	3	3	0	0	3
4	20CI401	IOT System Architectures	PC	3	3	0	0	3
5	20HS401	Environmental Science and Engineering **(Common to all B.E./B.Tech programmes)**	HS	2	2	0	0	2
THEORY CUM PRACTICAL								
6	20CS404	Operating Systems	PC#	5	3	0	2	4
PRACTICAL								
7	20CS4L1	Database Management Systems Laboratory	PC#	4	0	0	4	2
8	20CS5L1	Computer Networks Laboratory	PC#	4	0	0	4	2
TOTAL				**28**	**17**	**1**	**10**	**23**

 # Common to B.E CSE , B.Tech IT, B.Tech AIDS, CSE (CS) & CSE(IOT) programmes

20BS303	DISCRETE MATHEMATICS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To understand the basic concepts of Logic, Combinatorics and Graph Theory.
- To make the student familiarize the Applications of Algebraic Structures.
- To understand the concepts and significance of Lattices and Boolean algebra whichare widely used in Computer Science and Engineering.

PRE-REQUISITE: NIL

UNIT I LOGIC AND PROOFS 12

Propositional logic – Propositional equivalences - Predicates and Quantifiers – NestedQuantifiers – Rules of Inference - Introduction to Proofs – Proof methods and strategy.

UNIT II COMBINATORICS 12

Mathematical Induction – Strong Induction and Well ordering – The basics of Counting -The Pigeon hole Principle – Permutations and Combinations – Recurrence Relations – Solving Linear Recurrence Relations – Generating Functions – Inclusion and Exclusion Principle and its Applications.

UNIT III REPRESENTATION OF STANDARD GRAPHS 12

Graphs and Graph Models – Graph Terminology and special types of Graphs – Matrix Representation of Graphs and Graph Isomorphism – Connectivity – Euler and Hamilton Paths.

UNIT IV ALGEBRAIC STRUCTURES 12

Algebraic Systems – Semi Groups and Monoids - Groups – Subgroups – Homomorphism's – Normal Subgroup and Cosets – Lagrange's Theorem – Definitions and Examples of Ringsand Fields.

UNIT V LATTICES AND BOOLEAN ALGEBRA 12

Partial Ordering — Posets — Lattices as Posets — Properties of Lattices - Lattices as Algebraic Systems – Sub Lattices – Direct Product and Homomorphism – Some specialLattices — Boolean Algebra.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Tremblay.J.P. and Manohar.R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Publishing company Limited, New Delhi, 30th Reprint,2008.
2. Veerarajan .T, "Discrete Mathematics with graph theory and combinatorics", Tata McGraw –Hill companies, New Delhi, 4th Reprint,2008.

REFERENCES:

1. Grimaldi. R.P., "Discrete and Combinatorial Mathematics: An Applied Introduction",Pearson Education Asia, Delhi, 5th Edition, 2007.
2. Rosen.K.H., "Discrete Mathematics and its Applications", Tata McGraw Hill Publishingcompany Limited, New Delhi, 7th Edition, 2011.
3. Koshy.T. "Discrete Mathematics with Applications", Elsevier Publications,2011.
4. Venkatraman.M.K., Sridharan.V., Chandrasekaran.C., "Discrete Mathematics", NationalPublishing company, 1st Edition,2001.
5. Tamilarasi. A and Natarajan A.M., "Discrete Mathematics and its Application", Khanna Publishers, 3rd Edition, 2006.

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : DISCRETE MATHEMATICS		**Course Code : 20BS303**			
CO	**Course Outcomes**	**Unit**	**K-CO**	**POs**	**PSOs**
C201.1	Apply the basic formula to formulate the normal forms and Predicate calculus.	1	K3	1, 2, 3, 8&9	
C201.2	Solve combinatorial problems using the basic counting techniques	2	K3	1, 2, 3, 8&9	
C201.3	Solve recurrence relations using generating functions.	2	K3	1, 2, 3, 8&9	
C201.4	Apply the concepts of graph theory in the computer science and technologies field.	3	K3	1, 2, 3, 8&9	
C201.5	Apply the concepts and properties of algebraic structures such as groups, rings and fields.	4	K3	1, 2, 3, 8&9	
C201.6	Determine the partial ordering, lattices as posets and Boolean algebra using logical relation.	5	K3	1, 2, 3, 8&9	

CO-PO Mapping														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C201.1	3	2	1					1	**1**					
C201.2	3	2	1					1	1					
C201.3	3	2	1					1	1					
C201.4	3	2	1					1	1					
C201.5	3	2	1					1	1					
C201.6	3	2	1					1	1					

20IT301	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand basic principle of Object-Oriented Programming
- To understand the characteristics of java and basics of java programming tool.
- To know the principles of inheritance and interfaces
- To define exceptions and use I/O streams
- To develop a java application with threads and generics classes
- To design and build simple Graphical User Interfaces

PRE-REQUISITE:

Course code :20CS201
Course Name : Programming in C

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 9

Introduction to Object Oriented Programming –Differences between Structure programming and OOPS-Characteristics of Java – The Java Environment -Java Source File -Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments, finalize method, Automatic Garbage Collection.

UNIT II INHERITANCE AND INTERFACES 9

Inheritance – the Object class – abstract classes and methods- final methods and classes – Interfaces –differences between classes and interfaces and extending interfaces - Object cloning, Reflection, Proxies -inner classes, Array Lists - Strings

UNIT III EXCEPTION HANDLING AND I/O 9

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Assertions, logging, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files-Sequential Access file and Random Access file.

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING 9

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Inheritance & Generics – Reflection & Generics-Bounded Types – Restrictions and Limitations.

UNIT V EVENT DRIVEN PROGRAMMING 9

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes- Case Study: Design an application for automating the file processing by using the java swing with mysql database.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Herbert Schildt, "Java The complete reference", 9th Edition, McGraw Hill Education, 2017.
2. Cay S. Horstmann, Gary cornell, "Core Java Volume –I Fundamentals", 9th Edition, Prentice Hall, 2013.
3. E. Balagurusamy, " Programming with Java", 6th Edition, McGraw Hill Education, 2019.

REFERENCES:

1. Paul Deitel, Harvey Deitel, "Java SE 8 for programmers", 3rd Edition, Pearson, 2015.
2. Steven Holzner, "Java 2 Black book", Dream tech press, 2011.
3. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME: OBJECT ORIENTED PROGRAMMING													**COURSE CODE:20IT301**	
	Course Outcomes												**Unit**	**K–CO**	**POs**	**PSOs**
C202.1	Realize the Object-Oriented Programming concepts and Basics of java Programming tool												1	K2	1,2,10	1,2
C202.2	Apply the concepts of inheritance and interfaces using java programs												2	K3	1,2,3,12	1,2
C202.3	Construct java exceptions and I/O streams												3	K3	1,2,3,10	1,2
C202.4	Illustrate multithread concepts and generics in java												4	K3	1,2,3,12	1,2
C202.5	Develop interactive java application using AWT												5	K3	1,2,3,10	1,2
C202.6	Build interactive java application using Swing												5	K3	1,2,3,12	1,2
CO-PO Mapping																
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**		
C202.1	2	1	-	-						1			1	1		
C202.2	3	2	1	-								1	1	1		
C202.3	3	2	1	-						1			1	1		
C202.4	3	2	1	-								1	1	1		
C202.5	3	2	1	-						1			1	1		
C202.6	3	2	1									1	1	1		

20CS302	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts of ADTs
- To understand the basics of algorithm analysis
- To Learn linear data structures – lists, stacks, and queues
- To apply Tree and Graph structures
- To understand sorting, searching and hashing algorithms and their analysis.

PRE-REQUISITE:

Course code :20CS201

Course Name : Programming in C

UNIT - I INTRODUCTION TO DATA STRUCTURES AND ALGORITHM ANALYSIS **10**

Introduction: Data Structures, Notion of an algorithm, Algorithm Efficiency and Analysis Framework, Asymptotic Notations and their properties. Linear Data Structures: Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation —– Singly Linked Lists- Circularly Linked Lists- Doubly-Linked Lists – Applications of Lists – Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

Implementation of algorithmic problems.

UNIT - II LINEAR DATA STRUCTURES – STACKS, QUEUES **8**

Stack ADT – Operations – Applications– Evaluating arithmetic expressions- Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue – Priority Queue – deQueue – Applications of Queues.

UNIT - III NON LINEAR DATA STRUCTURES – TREES **9**

Tree ADT – Tree Traversals – Binary Tree ADT – Expression Trees – Applications of Trees – Binary Search Tree ADT –Threaded Binary Trees- AVL Trees – B-Tree – B+ Tree – Heap – Applications of heap.

UNIT - IV NON LINEAR DATA STRUCTURES – GRAPHS **9**

Definition – Representation of Graph – Types of graph – Breadth-first traversal – Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications ofgraphs.

UNIT - V SEARCHING, SORTING AND HASHING TECHNIQUES **9**

Divide and Conquer Methodology: Comparison of Searching Techniques: Linear Search –Binary Search, Mathematical analysis of Binary Search. Sorting – Merge Sort, Quick Sort,Bubble sort — Selection sort — Insertion sort — Shell sort — Radix sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Mark Allen Weiss, —– Data Structures and Algorithm Analysis in C, 2nd Edition Reprint, Pearson Education, 2002.
2. Reema Thareja, —– Data Structures Using C, Second Edition, Oxford University Press,2011.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein – Introduction to Algorithms, MIT Press, Third Edition, 2009.

REFERENCES:

1. Stephen G. Kochan, —Programming in C, 3rd edition, Pearson Education, 2005.
2. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, — Fundamentals of Data Structuresin C, Second Edition, University Press, 2008.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME: DATA STRUCTURES AND ALGORITHMS		COURSE CODE: 20CS302			
	Course Outcomes	**Unit**	**K–CO**	**POs**	**PSOs**
C203.1	Explain the concept of asymptotic notations and algorithmic efficiency with properties	1	K2	1-2, 8-9, 12	1
C203.2	Describe abstract data types and implement various algorithmic problems using arrays and linked list.	1	K2	1-2, 8-9, 12	1
C203.3	Apply the different linear data structures like stack and queue to various computing problems.	2	K3	1-3, 8-9, 12	1
C203.4	Build different types of trees and graphs and apply various operations and their applications.	3,4	K3	1-3, 8-10, 12	1
C203.5	Analyze different sorting and searching techniques based on time and space complexity of the algorithms designed using divide and conquer methods.	5	K4	1-4, 8-10, 12	1
C203.6	Develop suitable hashing algorithm for indexing data items into specific locations in a hash table considering collision resolution techniques.	5	K3	1-3, 8-10, 12	1

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C203.1	2	1	-	-	-	-	-	1	1	-	-	2	2	-
C203.2	2	1	-	-	-	-	-	1	1	-	-	2	3	-
C203.3	3	2	1	-	-	-	-	1	1	-	-	2	3	-
C203.4	3	2	1	-	-	-	-	1	1	1	-	2	3	-
C203.5	3	3	2	1	-	-	-	1	1	1	-	2	3	-
C203.6	3	2	1	-	-	-	-	1	1	1	-	2	3	-

20CI301	SENSORS AND MICROCONTROLLERS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand different types of sensors and actuators for different environments.
- To introduce low power microcontrollers and to develop the skill set of programming low power sensing applications
- To upgrade the students by introducing them Advanced ARM Cortex microcontrollers

PRE-REQUISITE: NIL

UNIT I CLASSIFICATION AND CHARACTERISTICS OF SENSORS 9

Classification of Sensors and Transducers - Units and Measurements – Static Characteristics: Range, Span, Resolution, Accuracy, Errors, Repeatability, Sensitivity, Hysteresis. Dynamic Characteristics - Calibration – Transient response of first order system.

UNIT II SENSORS AND ACTUATORS 9

Temperature Sensors: Thermistors, Thermocouple, RTD - signal conditioning circuits. Piezoelectric sensor, Pressure sensor , Displacement sensor. Motion sensor, Accelerometers-Piezoelectric and Inductive, proximity sensor. DC Drives - DC motor- stepper motor-servomotor.

UNIT III DATA ACQUISITION AND LOGGING 9

Sampling concepts, Analog to Digital converters - Successive Approximation and Integrating type – Characteristics of ADC. Digital to Analog converter- R-2R Ladder type- Characteristics of DAC, Data logging - interfacing SD card -multi channel data logging.

UNIT IV MICROCONTROLLER 9

8-Bit Microcontroller – Architecture of 8051 – Instruction Set, Addressing modes and Programming – Programming Parallel Ports – Timers and Serial Port – Interrupt Handling-Memory and I/O Devices Interfacing.

UNIT V TEXAS MSP430 9

Architecture of the MSP430 – Memory - Addressing modes – Constant Generator and Emulated Instructions - instruction set-Clock system. Functions, Interrupts and low-power modes of operations.

TOTAL:45PERIODS

TEXTBOOKS:

1. D. V. S. Murty," Transducers And Instrumentation", Prentice Hall of India (Pvt) Ltd, 2010
2. N.Mathivanan, "PC –Based Instrumentation- Concepts and Practices", Prentice Hall of India (Pvt) Ltd,2011.
3. John H. Davies, "MSP430 Microcontroller Basics", 2011, 2nd ed., Newnes publishing, New York.

REFERNCES:

1. Patranabis D,"Sensor and Actuators", 2003, Prentice Hall of India (Pvt)Ltd,
2. Kenneth Ayala,' The 8051 Microcontroller, Architecture, Programming and Microcontroller,2nd edition 2007,West Publishing company

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME : SENSORS AND MICROCONTROLLERS		**COURSE CODE : 20CI301**			
CO	Course Outcomes	Unit	K-CO	POs	PSOs
C204.1	Explain the classification and operating principles of various sensors and transducers and Analyze the static and dynamic characteristics of sensors,	1	K2	1,2,9	-
C204.2	Explain the circuits for different types of sensors including signal conditioning and describe the operating principles and applications of various actuators.	2	K2	1,2,9	-
C204.3	Apply the principles of ADC and DAC circuits and assess their performance in converting digital signals to analog form and analog to digital form.	3	K3	1,2,3,5,9	-
C204.4	Discuss data logging systems with SD card interfacing and manage multi-channel data logging.	3	K2	1,2,9	-
C204.5	Explain the architecture, instruction set, and addressing modes of the 8-bit 8051 microcontroller.	4	K2	1,2,5,9	-
C204.6	Describe the architecture and unique features of the Texas MSP430 microcontroller, including memory organization and low-power modes.	5	K2	1,2,5,9	-

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C204.1	2	1	-	-	-	-	-	-	1	-	-	-	-	-
C204.2	2	1	-	-	-	-	-	-	1	-	-	-	-	-
C204.3	3	2	1	-	1	-	-	-	1	-	-	-	-	-
C204.4	2	1		-	-	-	-	-	1	-	-	-	-	-
C204.5	2	1	-	-	1	-	-	-	1	-	-	-	-	-
C204.6	2	1	-	-	1	-	-	-	1	-	-	-	-	-

20CI302	DIGITAL PRINCIPLES AND SYSTEM DESIGN	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To design digital circuits using simplified Boolean functions
- To design and analyze combinational circuits
- To design and analyze synchronous and asynchronous sequential circuits
- To understand Memory and Programmable Logic Devices
- To write HDL code for combinational and sequential circuits

PRE-REQUISITE: NIL

UNIT – I BOOLEAN ALGEBRA AND LOGIC GATES 9

Number Systems - Arithmetic Operations - Binary Codes - Boolean Algebra and Logic Gates - Theorems and Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms - Simplification of Boolean Functions using Karnaugh Map - Logic Gates – NAND and NOR Implementations.

UNIT - II COMBINATIONAL LOGIC 9

Combinational Circuits – Analysis and Design Procedures – Half and Full Adder/ Subtractor -Binary Adder-Subtractor – 2 bit Magnitude Comparator - Decoders – Encoders – Multiplexers – De Mux - Code converters (Binary to Gray and Gray to Binary).

UNIT - III SYNCHRONOUS SEQUENTIAL LOGIC 9

Sequential Circuits - Storage Elements: Latches, Flip-Flops-Characteristic table-Excitation table-Characteristic equation - Registers and Counters (Synchronous and Ripple counters) - Analysis and Design of Clocked Sequential Circuits - State Reduction and Assignment

UNIT - IV ASYNCHRONOUS SEQUENTIAL LOGIC 9

Analysis of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race free State Assignment – Hazards

UNIT - V PROGRAMMABLE LOGIC DEVICES AND HDL 9

RAM – ROM - Programmable Logic Array – Programmable Array Logic- Introduction to HDL – Verilog Models - Gate Level Modelling of Combinational circuits - Decoder – 2 bit Comparator-Multiplexer - Behavioural Modelling of Sequential Circuits - D flip flop and JK flip flop – Mod N counters.

LAB COMPONENT 30 PERIODS

1. Verification of Boolean Theorems & Laws
2. Implementation of Boolean Function using gates
3. 4 bit binary Adder/Subtractor
4. Code converters
5. Implementation of Function Using Multiplexer
6. Encoder and Decoder
7. Shift Registers
8. Synchronous Counters
9. Verilog coding for simple combinational and sequential circuits

TOTAL: 75 PERIODS

TEXT BOOKS:

1. M. Morris R. Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog", 6th Edition, Pearson Education, 2018.
2. Dr. P. Leach and A.P. Malvino, "Digital Principles and Applications", Tata McGraw Hill, 2011

REFERENCES:

1. G. K. Kharate, Digital Electronics, Oxford University Press, 2012.
2. John F. Wakerly, Digital Design Principles and Practices, 5th Edition, Pearson Education, 2018.
3. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, 6th Edition, Cengage Learning, 2013.
4. Donald D. Givone, Digital Principles and Design, Tata McGraw Hill, 2017.
5. A.Anandkumar, Fundamentals of Digital circuits, 4th Edition, PHI.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME : DIGITAL PRINCIPLES AND SYSTEM DESIGN		**COURSE CODE : 20CI302**			
CO	**Course Outcomes**	**Unit**	**K-CO**	**POs**	**PSOs**
C205.1	Apply Arithmetic operations in any number system and various techniques to simplify the Boolean function.	1	K3	1,2,3,10	
C205.2	Design combinational circuits that perform arithmetic operations.	2	K3	1,2,3,12	
C205.3	Design Flipflops, counters and registers	3	K3	1,2,3,4,10	
C205.4	Design and analyze Synchronous sequential circuits.	3	K3	1,2,3,4,12	
C205.5	Analyze Asynchronous sequential circuits.	4	K3	1,2,10	
C205.6	Model memory arrays for any Boolean function with the help of PLD's and simulate various combinational and sequential circuits using HDL.	5	K3	1,2,5,10	

CO-PO mapping														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C205.1	3	2	1							1				
C205.2	3	2	1									1		
C205.3	3	3	2	1						1				
C205.4	3	3	2	1								1		
C205.5	2	1								1				
C205.6	2	1			1							1		

20HS301	UNIVERSAL HUMAN VALUES	L	T	P	C
		2	1	0	3

OBJECTIVES:

- To create an awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life

PRE-REQUISITE: NIL

UNIT-I INTRODUCTION TO VALUE EDUCATION **9**

Value Education — Definition - Concept and Need for Value Education - The Evolution of Value Education: Natural acceptance, Self exploration - Fundamentals of value education - Happiness and Prosperity as parts of Value Education- fulfilling human aspirations.

Practice sessions: To discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT-II HARMONY IN THE HUMAN BEING **9**

Human being vs Value education - I' and Body synchronization - Understanding Myself as Co-existence of the Self and the Body - Realization - Self, Body needs - Scanning of Karma -Self and Body- Understanding Sanyam and Health.

Practice sessions: To discuss the role others have played in making material goods available to self. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT - III HARMONY IN THE FAMILY, SOCIETY AND NATURE **9**

Family as a basic unit of Human Interaction-Values in Relationships - The Basics for Trust and Respect in today's Crisis: Affection, e-Guidance, Reverence, Glory, Gratitude and Love — Harmony in society : Resolution, Prosperity, Fearlessness and Co-existence as Comprehensive Human Goal-Harmony in Nature: The Four Orders in Nature - The Holistic Perception of Harmony in Existence.

Practice sessions: To discuss on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education. Gratitude as a universal value in relationship. Discuss with scenarios. Elicit examples from students' lives.

UNIT - IV SOCIAL ETHICS **9**

The Basics for Ethical Human Conduct - Defects in Ethical Human Conduct - Holistic Alternative and Universal Order - Universal Human Order and Ethical Conduct - Human Rights violation and Social Disparities.

Practice sessions: To discuss human being as cause of imbalance in nature, pollution, depletion of resources and role of technology

UNIT - V PROFESSIONAL ETHICS **9**

Value based Life and Profession - Professional Ethics and Right Understanding - Competence in Professional Ethics - Issues in Professional Ethics — The Current Scenario - Vision for Holistic Technologies, Production System and Management Models.

Practice sessions: To discuss the conduct as an engineer or scientist

TOTAL: 30 PERIODS + 15 TUTORIALS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSENAME: UNIVERSAL HUMAN VALUES		**COURSE CODE:20HS301**			
	Course Outcomes	**Unit**	**K–CO**	**POs**	**PSOs**
C206.1	Explain the significance of value inputs in a classroom and summarize human aspirations.	1	AD	6, 7, 8, 9,10,12	-
C206.2	Distinguish between Values & Skills to ensure happiness and prosperity.	1	AD	6, 7, 8, 9,10,12	-
C206.3	Identify the synchronization between Thyself & the Body to ensure competency of an individual	2	AD	6, 7, 8, 9,10,12	-
C206.4	Generalize the role of a human being in ensuring harmony in society and nature.	3	AD	6, 7, 8, 9,10,12	-
C206.5	Distinguish between ethical and unethical practices and analyze harmonious social environment.	4	AD	6, 7, 8, 9,10,12	-
C206.6	Assess the importance of value based life and evaluate the role of professional ethics.	5	AD	6, 7, 8, 9,10,12	-

CO-PO Mapping

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C206.1	-	-	-	-	-	3	2	3	2	2	-	1	-	-
C206.2	-	-	-	-	-	3	2	3	2	2	-	1	-	-
C206.3	-	-	-	-	-	3	2	3	2	2	-	1	-	-
C206.4	-	-	-	-	-	3	2	3	2	2	-	1	-	-
C206.5	-	-	-	-	-	3	2	3	2	2	-	1	-	-
C206.6	-	-	-	-	-	3	2	3	2	2	-	1	-	-

20CS3L2	DATA STRUCTURES AND ALGORITHM LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- Write functions to implement linear and non-linear data structure operations
- Suggest appropriate linear / non-linear data structure operations for solving a given problem
- Appropriately use the linear / non-linear data structure operations for a given problem
- Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval

LIST OF EXPERIMENTS

1. Implementation of List and Stack Using Array
2. Implementation of List and Stack Using Linked list
3. Implementation of Queue Using Linked List
4. Perform polynomial addition using list
5. Perform Infix to postfix conversion using stack
6. Implementation of Binary tree
7. Implementation of Binary Search tree
8. Implementation of AVL Trees
9. Implementation of Heaps using Priority Queues
10. Implementation of Graph Traverses Using Breadth First Search
11. Implementation of Graph Traverses Using Depth First Search
12. Applications of Graph.
13. Case study problem for sorting and searching

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Software Requirement : Sublime editor / Turbo C

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME: DATASTRUCTURESANDALGORITHMS LABORATORY		**COURSECODE: 20CS3L2**			
	Course Outcomes	**Ex.No.**	**K–CO**	**POs**	**PSOs**
C207.1	Develop the array implementation of stack, Queue and List ADTs	1	K3	1-3, 8-10, 12	1
C207.2	Develop the Linked list implementation of list, Stack and Queue ADTs	2-5	K3	1-3, 8-10, 12	1
C207.3	Construct Binary trees, Binary search Trees and AVL tree and its operations	6-9	K3	1-3, 8-10, 12	1
C207.4	Develop various graph traversal algorithms like BFS and DFS.	10-12	K3	1-3, 8-10, 12	1
C207.5	Analyze the performance of various searching, sorting and hashing algorithms	13	K4	1-4, 8-10, 12	1
C207.6	Illustrate any real world problem by implement various techniques of Data structures.	13-14	K4	1-4, 8-11, 12	1

CO-PO Mapping

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C207.1	3	2	1	-	-	-	-	1	1	1	-	2	3	-
C207.2	3	2	1	-	-	-	-	1	1	1	-	2	3	-
C207.3	3	2	1	-	-	-	-	1	1	1	-	2	3	-
C207.4	3	2	1	-	-	-	-	1	1	1	-	2	3	-
C207.5	3	3	2	1	-	-	-	1	1	1	-	2	3	-
C207.6	3	3	2	1	-	-	-	1	1	1	1	2	3	-

20CS3L3 OBJECT ORIENTED PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To build software development skills using java programming for real-world applications.
- Tounderstandandapplytheconceptsofclasses,packages,interfaces,arraylist,exceptionhandling and file processing
- To develop applications using generic programming and event handling.

LISTOFEXPERIMENTS

1. Develop a Java application to generate Electricity bill. Create a class with the followingmembers:Consumerno.,consumername,previousmonthreading,currentmonthreading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff.
   If the type of the EB connection is domestic, calculate the amount to be paid as follows:

First100units	Rs.1.00perunit
101-200 units	Rs.2.50perunit
201-500units	Rs.4.00perunit
>501units	Rs.6.00perunit

   If the type of the EB connection is commercial, calculate the amount to be paid as follows:

First100units	Rs.2.00perunit
101-200 units	Rs.4.50perunit
201-500units	Rs.6.00perunit
>501units	Rs.7.00perunit

2. Develop a java application to implement currency converter (DollartoINR,EUROtoINR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and viceversa),time converter (hours to minutes,seconds andviceversa)using packages.
3. Develop a java application with Employee class with Emp_name, Emp_id, Address,Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF,0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
4. Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.
5. WriteaprogramtoperformstringoperationsusingArrayList.Writefunctionsforthefollowing
   a. Append-add at end
   b. Insert–add at particular index
   c. Search
   d. List all string starts with given letter
6. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area().Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

7. Write a Java program to implement user defined exception handling.
8. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.
9. Write a java program that implements a multithreaded application that has three threads. First thread generates a random integer every 1second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
10. Write a java program to find the maximum value from the given type of elements using a generic function.
11. Designacalculatorusingevent-drivenprogrammingparadigmofJavawiththefollowingoptions.
    a) Decimal manipulations
    b) Scientific manipulations
12. Develop a mini project for any application using Java concepts.

TOTAL:60 PERIODS

SOFTWARE:JDK8.0 /Netbeans 11

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME: OBJECTORIENTEDPROGRAMMINGLABORATORY		**COURSECODE: 20CS3L3**			
	Course Outcomes	**Ex.No.**	**K–CO**	**POs**	**PSOs**
C208.1	Develop and implement Java programs for simple applications using classes and packages.	1-3	K3	1-3, 8-10, 12	1,2
C208.2	Develop and implement Java programs with inheritance and interfaces.	4-6	K3	1-3, 8-10, 12	1,2
C208.3	Develop simple java programs for files usage and exceptions handling.	7,8	K3	1-3, 8-10, 12	1,2
C208.4	Develop simple java programs by implementing multithread concepts and generics.	9,10	K3	1-3, 5, 8-10, 12	1,2
C208.5	Develop interactive java application using AWT and Swing.	11	K3	1-3, 5, 8-12	1,2
C208.6	Illustrate any real world problem by implement various OOPs concepts.	12	K4	1-5, 8-12	1,2

CO – PO mapping

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C208.1	3	2	1	-	-	-	-	1	1	1	-	2	3	1
C208.2	3	2	1	-	-	-	-	1	1	1	-	2	3	1
C208.3	3	2	1	-	-	-	-	1	1	1	-	2	3	1
C208.4	3	2	1	-	1	-	-	1	1	1	-	2	3	1
C208.5	3	2	1	-	1	-	-	1	1	1	1	2	3	1
C208.6	3	3	2	1	1	-	-	1	1	1	1	2	3	1

20BS403 PROBABILITY, STATISTICS AND QUEUING THEORY

L	T	P	C
3	1	0	4

OBJECTIVES:

- To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
- To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
- To understand the concept of queuing models and significance of advanced queuing models apply in engineering.

PRE-REQUISITE: NIL

NIT – I PROBABILITY AND RANDOM VARIABLES 12

Probability - Discrete and continuous random variables – Moments –Moment generating functions – Binomial, Poisson, Uniform, Exponential and Normal distributions.

UNIT – II TWO – DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression –Transformation of random variables –Central limit theorem (forindependent and identically distributed random variables).

UNIT – III RANDOM PROCESSES 12

Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markovchain – Chapman Kolmogorov equations - Limiting distributions.

UNIT – IV QUEUEING MODELS 12

Markovian queues – Birth and death processes – Single and multiple server queueing models — Little's formula — Queues with finite waiting rooms–Queues with impatient customers: Balking and reneging.

UNIT – V ADVANCED QUEUEING MODELS 12

Finite source models - M/G/1queue–Pollaczek Khinchin formula-M / D / 1 and M / E_K / 1 asspecial cases– Series queues–Open Jackson networks.

TOTAL:60 PERIODS

TEXTBOOKS:

1. Ibe.O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, IndianReprint, 1st Edition, 2010.
2. Trivedi.K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, 1st Edition, 2002.

REFERENCES:

1. Gross.D.,Shortle, J.F, Thompson, J.M and Harris. C.M., "Fundamentals of QueueingTheory", Wiley Student, 4th Edition, 2013.
2. Yates.R.D. and Goodman.D.J., "Probability and Stochastic Processes", Wiley India Pvt.Ltd., Bangalore, 2nd Edition, 2012.
3. Taha.H.A., "Operation Research", Pearson India Education Services, Delhi, 9th Edition,2016.
4. Veerarajan.T., "Probability, Statistics and Random Processes", Tata McGraw Hill, NewDelhi, 2006.
5. Gupta.S.C.,Kapoor.V.K,, "Fundamental of Mathematical Statistics", Sultanchand & Sons Educational Publishers, NewDelhi, Reprint 2013.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME: PROBABILITY , STATISTICS AND QUEUEING THEORY		**COURSECODE: 20BS403**			
	Course Outcomes	**Unit**	**K–CO**	**POs**	**PSOs**
C209.1	Build the parameters of statistical distributions using basic probability theory concepts	1	K3	1-3, 8,9	
C209.2	Calculate the statistical measures for two dimensional random variables	2	K3	1-3, 8,9	
C209.3	Apply the concepts of correlation and regression for two dimensional random variables.	2	K3	1-3, 8,9	
C209.4	Apply the concept of random processes in engineering disciplines	3	K3	1-3, 8,9	
C209.5	Solve queueing models using finite and infinite server model	4	K3	1-3, 8,9	
C209.6	Solve advanced queueing models using open network.	5	K4	1-3, 8,9	

CO – PO mapping

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C209.1	3	2	1					1	1					
C209.2	3	2	1					1	1					
C209.3	3	2	1					1	1					
C209.4	3	2	1					1	1					
C209.5	3	2	1					1	1					
C209.6	3	3	1					1	1					

20CS402	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the fundamentals of data models and to depict a database system using ERdiagrams.
- To study relational database and to write SQL queries to store/retrieve data to/from database.
- To understand the fundamental concepts of transaction processing- concurrency controltechniques and recovery procedures for real time applications.
- To understand working procedures of query processing and query optimization techniques.
- To understand the internal storage structures using different file and indexing techniqueswhich will help in physical DB design.
- To study concepts of advanced databases.

PRE-REQUISITE:

COURSE CODE: 20CS302

COURSE NAME: Data Structures and Algorithms

UNIT - I DATABASE FUNDAMENTALS 8

Purpose of Database System – Views of data – Database System Architecture – Introduction to Data Models – Network model – Hierarchical Model – Introduction to Relational Model – Constraints – keys – Entity Relationship Model – Entity Sets – Attributes - Extended E-R features – ER reduction to Relational Schemas.

UNIT - II RELATIONAL AND ADVNACED DATABASE 10

Structure of Relational Database – Relational Query Language – Relational Algebra – SQL Fundamentals — Basic Queries — Set Operations — Aggregate Functions — Clauses — Subqueries — Correlated Subqueries — Joins — Views — Authorization — Advanced SQL — Triggers — Cursors — Procedure — Functions — Embedded SQL — Dynamic SQL — Types of advanced Databases – Distributed Database and Object Oriented Database Architectures - XML Databases: XML Hierarchical Model, DTD, XML Schema, X-Query - Introduction to NoSQL.

UNIT - III DATABASE DESIGN 9

Need for Database Design – Functional Dependencies – Closure of Functional Dependencies – Attribute Closure – Dependency Preservation – Decomposition – Canonical Cover – First Normal Form – Second Normal Form – Third Normal Form – Second Normal Form – Third Normal Form – Boyce Codd Normal Form – Multivalued Dependencies - Fourth Normal Form – Join Dependencies – Fifth Normal Form.

UNIT - IV TRANSACTIONS 9

Transaction Concepts – ACID properties – Transaction States – Serializability – Conflict Serializability — View Serializability — Concurrency Control — Lock Based Protocols — Deadlocks – Time Based Protocols – Stamp Based Protocols – Validation Based Protocols – Recovery System – Failure Classifications – Storage – Recovery and Atomicity – Recovery Algorithms.

UNIT - V STORAGE AND QUERY PROCESSING 9

RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices — B+ tree Index Files — B tree Index Files — Static Hashing — Dynamic Hashing — Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, —Database System Conceptsǁ,Sixth Edition, Tata McGraw Hill, 2011.
2. RamezElmasri, Shamkant B. Navathe, —Fundamentals of Database Systemsǁ, Sixth Edition, Pearson Education, 2011.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, —An Introduction to Database Systemsǁ,18th Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, —Database Management Systemsǁ, 4th Edition, McGraw-HillCollege Publications, 2015.
3. G.K.Gupta,"Database Management Systemsǁ, Tata McGraw Hill, 2011O G Palanna, “Engineering Chemistry”, McGraw Hill Education (India) PVT, LTD, Chennai, 2017.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME : DATABASE MANAGEMENT SYSTEMS		**COURSE CODE :** 20CS402			
CO	**Course Outcomes**	**Unit**	**K**	**POs**	**PSOs**
C210.1	Compare File Processing System with Database and summarize the basic concepts of Database, various Data Models and Database System Architecture.	1	K2	1-2, 12	1,2
C210.2	Identify Entities, Attributes and their Relationships to prepare ER diagram for real time applications.	1	K3	1-3, 8-9, 12	1
C210.3	Transfer an information model into a relational database schema and use DDL, DML, DQL, DCL, TCL and advanced concepts of SQL to implement the schema.	2	K3	1-3, 5, 8-10, 12	1
C210.4	Develop simple database using XML and relate advanced databases with relational model.	2	K3	1-3, 8-10, 12	1,2
C210.5	Construct a database by identifying dependencies and optimize it with suitable normal forms to reduce redundancy.	3	K3	1-3, 8-10, 12	1,2
C210.6	Compare real time applications with respect to transaction, concurrency control, and data object locking protocols and select appropriate storage and recovery techniques.	4	K4	1-5, 8-9, 12	1,2
C210.7	Identify the purpose of query processing and query optimization techniques and also demonstrate the query evaluation for given query.	5	K3	1-3, 5, 8-9, 12	1,2

CO – PO mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C210.1	2	1	-	-	-	-	-	-	-	-	-	1	3	1
C210.2	3	2	1	-	-	-	-	1	1	-	-	1	3	-
C210.3	3	2	1	-	1	-	-	1	1	1	-	1	3	-
C210.4	3	2	1	-	-	-	-	1	1	1	-	1	3	1
C210.5	3	2	1	-	-	-	-	1	1	1	-	1	3	1
C210.6	3	3	2	1	1	-	-	1	1	-	-	1	3	1
C210.7	3	2	1	-	1	-	-	1	1	-	-	1	3	1

20CS501	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand the concept of layering and functions of each layers of the protocol suits
- To be familiar with the components required to build different types of networks
- To learn concepts related to network addressing and routing
- To familiarize the functions and protocols of the layer of Transport layer
- To understand the working of various application layer protocols

PRE-REQUISITE: NIL

UNIT – I INTRODUCTION TO NETWORKS 8

Network Introduction: Evolution of Computer Networks, Classification of computer Networks LAN, WAN, MAN, Software Defined Networks (SDN), Network Topology: BUS, STAR, RING, MESH, OSI Layered Architecture, TCP/IP Protocol Suite.

UNIT – II MEDIA ACCESS & INTER NETWORKING 12

Medium Access Control Techniques: Random, Round Robin, Reservation: ALOHA Pure and Slotted, CSMA/CD-CSMA/CA- Ethernet-Token Ring-Token Bus-ARQ 3 Types, Data Link Layer design issues: Error Detection Codes, Parity Check, Checksum Error Correction Codes, Hamming codes, IEEE Standards: Bluetooth (802.15), Basic Internetworking: IP -CIDR-ARP -DHCP -ICMP.

UNIT – III NETWORK DEVICES AND NETWORK LAYER 8

Network Devices: Router, Switch, HUB, Bridge, Routing: Static Routing, Introduction to dynamic Routing, Categories of Routing – RIP v1 and RIP v2- OSPF-DSDV,IPV6 Addressing-IPV6 Protocol.

UNIT – IV TRANSPORT LAYER 9

Overview of Transport layer: UDP - Reliable byte stream (TCP), Connection Management: Flow control – Retransmission – TCP Congestion control, Congestion avoidance: DECbit -RED.

UNIT – V APPLICATION LAYER 8

Traditional applications: SSH – HTTP – FTP –DNS – SNMP- Telnet

TOTAL: 45 PERIODS

TEXT BOOK:

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.

REFERENCES

1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
3. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An OpenSource Approach, McGraw Hill Publisher, 2011.
4. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME:COMPUTER NETWORKS		**COURSE CODE:20CS501**			
	Course Outcomes	**Unit**	**K–CO**	**POs**	**PSOs**
C211.1	Explain the organization of computer networks with the concept of layered approach	1	K2	1,2,12	1
C211.2	Classify various Media Access Control Protocols techniques	2	K3	1,2,3,8,9,12	1
C211.3	Apply the error detection and error correction methods for bit streams	2	K3	1,2,3,8,9,12	1
C211.4	Utilize various types of routing techniques to forward packets	3	K3	1,2,3,8,9,10,12	1
C211.5	Describe the mechanisms involved in transport layer	4	K2	1,2,8,9,10,12	1
C211.6	Classify different application layer protocols	5	K3	1,2,3,8,9,10,12	1

CO-PO Mapping

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C211.1	2	1	-	-	-	-	-	-	-	-	-	1	2	-
C211.2	3	2	1	-	-	-	-	1	1	-	-	1	2	-
C211.3	3	2	1	-	-	-	-	1	1	-	-	1	2	-
C211.4	3	2	1	-	-	-	-	1	1	1	-	1	2	-
C211.5	2	1	-	-	-	-	-	1	1	1	-	1	2	-
C211.6	3	2	1	-	-	-	-	1	1	1	-	1	2	-

20CI401	IOT SYSTEM ARCHITECTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the fundamentals of Internet of Things
- To learn Smart Objects and IOT Architectures
- To learn about various IOT-related protocols
- To apply the concept of Internet of Things with Cloud into the Real World.

PRE-REQUISITE:NIL

UNIT-I INTRODUCTION TO IoT 9

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology

UNIT-II IoT ARCHITECTURE 9

M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - Information model - Functional model - Communication model – IoT reference architecture

UNIT - III IoT PROTOCOLS 9

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN- Network Layer: IP versions, Constrained Nodes and Constrained Networks - Optimizing IP for IoT: From 6LoWPAN to 6Lo, - Application Layer Protocols: CoAP and MQTT.

UNIT - IV IoT AND CLOUD COMPUTING 9

Cloud Computing: Grid/SOA and Cloud Computing, Cloud Middleware, NIST's SPI Architecture and Cloud Standards, Cloud Providers and Systems, Cloud of Thing: Th IoT and Cloud Computing, Mobile Cloud Computing, MAI Versus XaaS, The Cloud of Things Architecture.

UNIT - V CASE STUDIES 9

Domain Specific IoTs :Industrial IoT, Home Automation, Smart Cities, Energy - Smart Grid, EV Charging stations, Logistics, Environment, Agriculture, Industrial and Retail Applications, Health and Lifestyle

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approach, Universities Press, 2015.
2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, — IOT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017.
3. Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2012.

REFERENCES:

1. Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocols, Wiley, 2012 .
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer, 2011.
3. Jan Ho¨ ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis ,Karnouskos, Stefan Avesand. David Boyle, From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence, Elsevier, 2014.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : IOT SYSTEM ARCHITECTURES		Course code : 20CI401			
CO	**Course Outcomes**	**Unit**	**K –CO**	**POs**	**PSOs**
C212.1	Explain the concept of IOT Technologies.	1	K2	1,2,5,7,12	1,2
C212.2	Describe IOT architecture.	2	K2	1,2,5,7,12	1,2
C212.3	Explain various IoT Protocols	3	K2	1,2,5,7,12	1,2
C212.4	Describe the concept of Cloud Computing	4	K2	1,2,5,7,12	1,2
C212.5	Apply cloud concepts to configure IOT.	4	K3	1,2,3,5,7,12	1,2
C212.6	Apply IOT technologies in real time environment	5	K3	1,2,3,5,7,12	1,2

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C212.1	2	1	-	-	1	-	1	-	-	-	-	1	1	1
C212.2	2	1	-	-	1	-	1	-	-	-	-	1	1	1
C212.3	2	1	-	-	1	-	1	-	-	-	-	1	1	1
C212.4	2	1	-	-	1	-	1	-	-	-	-	1	1	1
C212.5	3	2	1	-	1	-	1	-	-	-	-	1	1	1
C212.6	3	2	1	-	1	-	1	-	-	-	-	1	1	1

20HS401	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
		2	0	0	2

OBJECTIVES:

- To study the scope and significance of environment
- To understand the interrelationship between living organism and environment
- To get a conceptual knowledge on various types of pollution and its effects
- To gain knowledge on various natural resources and its significances
- To provide knowledge on solid wastes ,disposal methods and natural disasters and its management
- To learn social issues such as human welfare, sustainability related to population

PRE-REQUISITE: NIL

UNIT - I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 6

Environment – definition, importance, public awareness

Ecosystem — concept, structure and function– producers, consumers and decomposers - characteristic features, structure and function of the forest ecosystem and grasslandecosystem

Biodiversity– definition, types - genetic, species and ecosystem diversity — values - consumptive use, productive use, social, ethical, aesthetic and option values — hot-spots ofbiodiversity –threats to biodiversity: habitat loss, poaching of wildlife — endangered and endemic species of India. Assignment on Conservation of biodiversity.

UNIT - II ENVIRONMENTAL POLLUTION 6

Definition, causes, effects and control measures of (i) Air pollution (ii) Water pollution (iii) Soil pollution (iv) Marine pollution – role of an individual in prevention of pollution – pollution casestudies - Climate change - global warming, acid rain, ozone layer depletion.

UNIT - III NATURAL RESOURCES 6

Forest resources: Uses, over-exploitation, deforestation, case studies

Water resources: Surface water and ground water - uses, over-utilization, conflicts overwater, Conservation of water - rain water harvesting, dams-benefits and problems

Mineral resources: uses, over exploitation, environmental effects of extracting mineral resources, case studies.

UNIT - IV SOLID WASTE AND DISASTER MANAGEMENT 6

Solid waste management: Introduction, types, effects on human beings and disposalmanagement.

Disaster management: Introduction, causes, effects and management of flood, cyclone, earthquake, landslide disasters, case studies– roles and responsibilities of Government and community

UNIT - V HUMAN POPULATION AND SOCIAL ISSUES 6

Population growth, population explosion – family welfare programme – women and child welfare – human rights – value education – sustainable development – resettlement and rehabilitation – waste land reclamation – role of information technology in environment and human health.
Debate on women and child welfare.

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Anubha Kaushik and Kaushik C.P., Environmental Science and Engineering, New Age International (P) Ltd, Sixth Edition, 2018.
2. Benny Joseph, Environmental Science and Engineering, Tata McGraw-Hill Publishing Company Ltd, New Delhi, ISBN: 0070601690, 2006.

REFERENCES:

1. Erach Bharucha, "Text book of Environmental Studies", Universities Press (I) PVT LTD, Hyderabad, 2015.
2. G. Tyler Miller and Scott E.Spoolman, "Environmental Science", Cengage Learning IndiaPVT, LTD, Delhi, 2014.
3. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education, 2004.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

Course Name : ENVIRONMENTAL SCIENCE AND ENGINEERING		**Course code : 20HS401**			
CO	**Course Outcomes**	**Unit**	**K –CO**	**POs**	**PSOs**
C213.1	Describe the environment ecosystem and their significances.	1	K2	6,7	
C213.2	Identify the threats to biodiversity and methods to conservebiodiversity	1	K3	6,7	
C213.3	Identify and implement technological and economicalsolution to	2	K3	6,7	
C213.4	Develop the knowledge on various natural resources and effect on environment due to over utililization	3	K3	6,7	
C213.5	Record the consequences of natural disasters	4	K2	6,7	
C213.6	Outline the social issues such as welfare, sustainability etc., and to relate with population growth	5	K2	6,7	

CO-PO Mapping														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C213.1	-	-	-	-	-	2	3	-	-	-	-	-	-	-
C213.2	-	-	-	-	-	2	3	-	-	-	-	-	-	-
C213.3	-	-	-	-	-	2	3	-	-	-	-	-	-	-
C213.4	-	-	-	-	-	2	3	-	-	-	-	-	-	-
C213.5	-	-	-	-	-	2	3	-	-	-	-	-	-	-
C213.6	-	-	-	-	-	2	3	-	-	-	-	-	-	-

20CS404	OPERATING SYSTEMS	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To understand the basic concepts and functions of operating systems.
- To understand Processes and Threads
- To analyze Scheduling algorithms.
- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To understand I/O management and File systems.
- To study various operating systems like Distributed OS, Real-Time OS and basicconcepts of virtualization

PRE-REQUISITE: NIL

UNIT - I OPERATING SYSTEM OVERVIEW 9

Operating system overview-objectives and functions, Evolution of Operating System, Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot. Processes - Process Concept, Process Scheduling, Operations
on Processes, Inter Process Communication.

LAB COMPONENT 6

1. Basic Linux Commands and Overview
2. Write Shell Script to experiment with system calls like fork, grep, pipe, open, create read,write, etc.

UNIT - II PROCESS MANAGEMENT AND CONCURRENCY CONTROL 9

CPU Scheduling - Scheduling criteria, Scheduling algorithms; Threads- Overview, Multithreading models, Threading issues; Process Synchronization - The critical-section problem, Semaphores, Classic problems of synchronization, Monitors; Deadlock - System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention,
Deadlock avoidance, Deadlock detection, Recovery from deadlock.

LAB COMPONENT 6

1. Implementation of FCFS, SJF, Round Robin, Priority Scheduling Algorithms andanalyzing their performance
2. Implement semaphore for solving producer-consumer problem using threads.
3. Simulate situations for testing Deadlock avoidance algorithm.

UNIT - III STORAGE MANAGEMENT 9

Main Memory — Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation; Virtual Memory — Background, Demand Paging, Page Replacement,Allocation, Thrashing; Allocating Kernel Memory.

LAB COMPONENT 6

1. Implementation Of FIFO, LRU, Optimal Page Replacement Algorithms

UNIT - IV MASS STORAGE AND FILE SYSTEMS 9

Mass Storage system – Disk Structure, Disk Scheduling and Management; File-System- File concept, Access methods, File Sharing and Protection, Allocation Methods, Free SpaceManagement; Directory- Structure, organization, implementation.

LAB COMPONENT 6

1. Implementation of Directory organizations like – single, two-level, hierarchy
2. Implementation of Allocation methods used for files like – sequential, indexed, linked

UNIT - V ADVANCED OPERATING SYSTEMS AND VIRTUALIZATION 9

Basics of Network Operating System, Server Operating System, Real Time Operating System and Distributed operating systems - Virtual machines- supporting multiple operating systems simultaneously on a single hardware platform; running one operating system on top of another.

LAB COMPONENT 6

1. Case Study to Learn Virtualization platforms – VM Ware, etc.
2. Installation of Raspbian OS in Raspberry pi
3. Simple C programs to execute OS services using Raspberry pi.

TOTAL: 75 PERIODS

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, ―– Operating System Concepts, 10th Edition, John Wiley and Sons Inc., 2018.
2. William Stallings, “Operating Systems — Internals and Design Principles”, 7th Edition, Prentice Hall, 2011.

REFERENCES:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, — Operating Systems – A Spiral Approach,Tata McGraw Hill Edition, 2010.
2. Achyut S.Godbole, Atul Kahate, — Operating Systemsll, McGraw Hill Education, 2016.
3. Andrew S. Tanenbaum, “Modern Operating Systems”, Fourth Edition, PearsonPublications, 2014.

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME : OPERATING SYSTEMS					**COURSE CODE :** 20CS404	
CO	**Course Outcomes**	**Unit**	**K**	**POs**	**PSOs**	
C214.1	Apply the basic functions of Operating System and Process communications.	1	K3	1-3, 8-10, 12	1	
C214.2	Analyze the performance of CPU scheduling algorithms specifically FCFS, SJF, Priority and Round Robin.	2	K4	1-4, 8-10, 12	1	
C214.3	Apply various process synchronization methods and deadlock avoidance algorithm for a given scenario.	2	K3	1-3, 8-10, 12	1	
C214.4	Develop memory management schemes using paging and segmentation	3	K3	1-3, 8-10, 12	1	
C214.5	Demonstrate various file allocation methods and directory structures.	4	K3	1-3, 8-10, 12	1	
C214.6	Classify different operating systems based on application requirements.	5	K3	1-3, 8-10, 12	1	
C214.7	Make use of virtualization platform to build virtual machines	5	K3	1-6, 8-10, 12	1	

CO – PO mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
C214.1	3	2	1	-	-	-	-	1	1	1	-	1	3	-
C214.2	3	3	2	1	-	-	-	1	1	1	-	1	3	-
C214.3	3	2	1	-	-	-	-	1	1	1	-	1	3	-
C214.4	3	2	1	-	-	-	-	1	1	1	-	1	3	-
C214.5	3	2	1	-	-	-	-	1	1	1	-	1	3	-
C214.6	3	2	1	-	-	-	-	1	1	1	-	1	3	-
C214.7	3	2	1	-	1	1	-	1	1	1	-	1	3	-

20CS4L1 DATABASE MANAGEMENT SYSTEMS LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To write and debug Database commands.
- To implement advanced query in Database tool.
- To use functions and procedures for implementing simple logics in Database.
- To design real time applications using front end tool and Database.
- To implement Database connectivity for real time application.

LIST OF PROGRAMS

1. Data Definition and Data Manipulation Language Commands.
2. Data Control and Transaction Control Language Commands.
3. Aggregate Functions and Set Operations.
4. Nested Subqueries and Join Queries.
5. Views, Indexes and Synonyms.
6. Study of PL/SQL programs
7. PL/SQL - procedures
8. PL/SQL - Functions
9. PL/SQL - Triggers
10. PL/SQL - Cursor
11. Front end application development – Create Forms, Menu and Reports.
12. Implementation of Database Connectivity

PLATFORM NEEDED: Oracle/Mysql/Visual Basics/Netbeans IDE

TOTAL: 60 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME : DATABASE MANAGEMENT SYSTEMS LABORATORY					**COURSE CODE :** 20CS4L1
CO	**Course Outcomes**	**Exp**	**K**	**POs**	**PSOs**
C215.1	Develop simple Database using DDL, DML and TCL commands.	1,2	K3	1-3, 8-10, 12	1,2
C215.2	Construct a Relational Database for real time application through Database constraints.	3	K3	1-3, 8-10, 12	1,2
C215.3	Make use of subqueries and join queries to derive and execute complex queries.	4-5	K3	1-3, 8-10, 12	1,2
C215.4	Develop PL/SQL programs to implement simple logics using Stored Procedure, Functions, Triggers and Cursor.	6-10	K3	1-3, 8-10, 12	1,2
C215.5	Develop a frontend application to display forms, menu and reports.	11	K3	1-3, 5, 8-10, 12	1,2
C215.6	Model real time applications with Database Connectivity.	12	K3	1-3, 5, 8-10, 12	1,2

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C215.1	3	2	1					1	1	1		1	3	1
C215.2	3	2	1					1	1	1		1	3	1
C215.3	3	2	1					1	1	1		1	3	1
C215.4	3	2	1					1	1	1		1	3	1
C215.5	3	2	1		1			1	1	1		1	3	2
C215.6	3	2	1		1			1	1	1		1	3	2

20CS5L1	NETWORKS LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To learn and use network commands.
- To learn socket programming.
- To implement and analyze various network protocols.
- To learn and use simulation tools.
- To use simulation tools to analyze the performance of various network protocols.

LIST OF EXPERIMENTS

1. Learn to use commands like TCP dump, netstat, ifconfig, nslookup and traceroute. Capture ping and trace route PDUs using a network protocol analyzer and examine.
2. Write a HTTP web client program to download a web page using TCP sockets.
3. Applications using TCP sockets like:
   a) Echo client and echo server
   b) Chat
   c) File Transfer
4. Simulation of DNS using UDP sockets.
5. Write a code simulating ARP /RARP protocols.
6. Write a program to implement RPC (Remote Procedure Call)
7. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
8. Study of TCP/UDP performance using Simulation tool.
9. Simulation of error correction code (like CRC).
10. Performance evaluation of Routing protocols using Simulation tool.
11. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer**.**
    a) Link State routing
    b) Flooding
    c) Distance vector

TOTAL: 60 PERIODS

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS:

1. Windows 7 or higher
2. C / C++ / Java / Python / Equivalent Compiler
3. Network simulator like NS2/Glomosim/OPNET/ Packet Tracer / Equivalent

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

COURSE NAME: NETWORKS LABORATORY		COURSECODE: 20CS5L1			
	Course Outcomes	**Ex.No.**	**K–CO**	**POs**	**PSOs**
C216.1	Demonstrate the different Network Commands	1	K3	1,2,3,8,9,10	1,2
C216.2	Develop Simple Socket Programming	2,3,4	K3	1,2,3,8,9,10	1,2
C216.3	Develop the code for Data Link Layer Protocol Simulation	5,6	K3	1,2,3,8,9,10	1,2
C216.4	Examine Congestion Control Algorithm using Network Simulator	7	K4	1,2,3,4,8,9,10	1,2
C216.5	Develop the code for Transport Layer Protocol Simulation	8,9	K3	1,2,3,8,9,10	1,2
C216.6	Illustrate the performance of various network Routing Protocols	10,11	K4	1,2,3,4,8,9,10	1,2

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C216.1	3	2	1	-	-	-	-	2	2	3	-	-	2	2
C216.2	3	2	1	-	-	-	-	2	2	3	-	-	2	2
C216.3	3	2	1	-	-	-	-	2	2	3	-	-	2	2
C216.4	3	3	2	1	-	-	-	2	2	3	-	-	2	2
C216.5	3	2	1	-	-	-	-	2	2	3	-	-	2	2
C216.6	3	3	2	1	-	-	-	2	2	3	-	-	2	2