Third Semester					
Theory					
Sl. No.	**Category**	**Subject Code**	**Subject Name**	**L-T-P**	**Credit**
1(a)	BSC	22CM3BS01T	Mathematics-III (Probability and Statistics, for the branches CSE,CST,IT,ECS ,ECE	3-0-0	3
1(b)	BSC	22CM3BS02T	Mathematics-III (for the branches EE,EEE,ME,CE)		
2	HSMC	22CM3HS01T/ 22CM3HS02T	**Humanities-I** Organizational Behavior/ **Management-I** Engineering Economics and Costing	3-0-0	3
4	ESC	22CM3ES01T	Data Structure using C	3-0-0	3
3	ESC	22CT3ES02T	Digital Logic Design	3-0-0	3
5	PCC-1	22CT3PC01T	**PCC-1:** Database Engineering	3-0-0	3
6	PCC-2	22CT3PC02T	**PCC-2:** Computer Network and Data Communication	3-0-0	3
7	MC	**Mandatory Course:**		3-0-0	0
		22CM3MC01T	Environmental Science and Engineering		
Total Credit (Theory)					**18**
Practical					
1	ESC	22CM3ES01L	Data Structure using C Laboratory	0-0-2	1
2	ESC	22CT3ES02L	Digital Logic Design Laboratory	0-0-2	1
3	PCC-1	22CT3PC01L	**PCC Lab-1:** Database Engineering Laboratory	0-0-2	1
4	PCC-2	22CT3PC02L	**PCC Lab-2:** Computer Network and Data Communication Laboratory	0-0-2	1
5	PSI	22CM3PS01L	Summer Internship / Summer Training / MOOC Certification	0-0-2	1
Total Credit (Practical)					**5**
Total Semester Credit					**23**

22CM3BS01T	Mathematics-III (Probability and Statistics) Brach: CSE, CST, IT, ECS, ECE	L-T-P 3-0-0	Credit :3

Objectives:
The course should enable the students to:

1. Enrich the knowledge of probability on single random variables and probability distributions.
2. Understand the foundations for classical inference involving confidence intervals and hypothesis testing.
3. Analyse the given data for appropriate test of hypothesis.
4. Apply the concept of correlation and regression.

Module-I: Probability [8 hrs]
Conditional Probability, Multiplicative Rules, Baye's Rule, Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions, Joint Probability Distributions. Mathematical Expectation: Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables.

Module-II: Probability Distributions [10 hrs]
Some Discrete Probability Distributions: Introduction and Motivation, Discrete Uniform Distribution, Binomial and Multinomial Distributions, Hypergeometric Distributions, Poisson Distribution and the Poisson Process. Some Continuous Probability Distributions: Continuous Uniform Distribution, Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial, Exponential distribution.

Module-III: Fundamental Sampling and Estimations [10hrs]
Fundamental Sampling Distributions and Data Descriptions: Random Sampling, Some Important Statistics, Sampling Distributions: Sampling Distribution of Means and Variances, t-distribution, One-Sample Estimation Problems: Introduction, Statistical Inference, Classical Methods of Estimation, Estimating the Mean (Single sample), Standard Error of Point Estimate, Prediction Intervals, Estimating the Variance (Single Sample).

Module-IV: Tests of Hypotheses [6 hrs]
One-Sample Tests of Hypotheses: Statistical Hypotheses, Testing a Statistical Hypothesis, One and Two-Tailed Tests, Tests Concerning a Single Mean (Variance Known), Relationship to Confidence Interval Estimation, Tests on a Single Mean (Variance Unknown), Goodness -of -Fit Test.

Module-V: Correlation and Regression [6 hrs]
Bivariate Distribution, Correlation, Scatter Diagram, Karl Pearson Coefficient of Correlation, Calculation of the Correlation Coefficient for a Bivariate Frequency Distribution, Probable Error of Correlation Coefficient, Rank Correlation, Regression, Correlation Ratio.

Text Books:
1. R. E. Walpole, S. L. Myers, and K. Ye, Probability and statistics for engineers and scientists, 8th Edition, Pearson. [Chapter- 2(2.6-2.8), Chapter-3(3.1 – 3.4), Chapter- 4(4.1 – 4.3), Chapter-5(5.1-5.4, and 5.6), Chapter-6(6.1 – 6.6), Chapter-8(8.1, 8.2, 8.4 – 8.7), Chapter-9(9.1 – 9.6, and 9.12), 10(10.1 – 10.7, and 10.14)]
2. S. C. Gupta, V. K. Kapoor, Fundamental of Mathematical Statistics, 10th revised edition, Sultan Chand &

Sons. [Chapter- 10(10.1 – 10.8)]

Reference Books:

1. J. E. Freund, Mathematical Statistics, 5th Edition, Prentice Hall of India pvt.Ltd., Eastern Economy Edition.
2. D. C. Montgomery and G. C. Runger, Applied Statistics and Probability for Engineers, 6th Edition, Wiley.
3. R. C. Johnson, Probability and Statistics for Engineers, 6th Edition, Prentice Hall of India pvt.Ltd., Eastern Economy Edition.

Course Outcomes:

On completion of this course, students are able to:

1. Use the basic probability rules, discrete and continuous probability distributions, including requirements of mean and variance.
2. Identify the characteristics of different discrete and continuous distributions. Identify the type of statistical situation to which different distributions can be applied.
3. Use of continuous distribution and various hypothesis of testing.
4. Employee the principles of linear regression and correlation and significance of the correlation coefficient.

--------- N.B: The course is of 3 credits with 4 contact hours ---------

22CM3BS01T 22CM3BS02T	Mathematics-III Branch: EE, EEE, ME, CE	L-T-P 3-0-0	Credit :3

Objectives:
The course should enable the students to:

1. Enrich the knowledge of numerical analysis to find the root and interpolating polynomial.
2. Apply the concept to find numerical differentiation and integration. Solve first order ordinary differential equation.
3. Apply the concept of Numerical analysis to enrich the knowledge of complex numbers, and complex functions.
4. Apply the knowledge of complex analysis to solve various integrations.

Module – I: Root Finding and Interpolation [8 Hours]
Root Finding: Introduction, Root finding by Bisection Method, Newton-Raphson Method, Regula-Falsi Method, Secant method, Fixed point method.
Interpolation: Lagrange, Newton forward and Backward, Divided Difference Method.

Module – II: Numerical Differentiation and Integration [8 Hours]
Differentiation: Derivative using Newton's forward and backward difference formula.
Integration: Trapezoidal Method, Simpson's 1/3rd and 3/8th rules, Gauss-Quadrature 2 -point& 3- point method.

Module – III: Numerical Solution of Ordinary Differential Equation [7 Hours]
First Order Differential equation by Taylor's series Method, Euler's method, Modified Euler's method, Runge-Kutta 4th order, Predicator & Corrector methods (Adams-Bashforth Method of order 4).

Module – IV: Complex Functions, Line Integral [9 Hours]
Complex Functions: Analytic function, C-R equation, Laplace equation, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic function.
Complex Integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of Analytic functions.

Module – V: Power series, Taylor series, Laurent series, Residue [8 Hours]
Sequences, Series, Power series, Functions given by power series, Taylor and Maclaurin series, Laurent series, Singularities and Zeros, Residues, Residue integration method.

Text Books:
1. E. Kreyszig, Advanced Engineering Mathematics, Tenth Edition, Willey.
(Chapter: 13, 14, 15 (15.1 – 15.4), 16 (16.1 – 16.3), 19 (19.1 – 19.3, 19.5), 21 (21.1 -21.2)
Reference Books:
1. M. K. Jain, S. R. K. Iyenger and R. K. Jain, Numerical Methods for
Scientific and engineering Computations, New Age International Publication (P) Ltd.
2. B. V. Raman, Higher Engineering Mathematics, Mc-Graw Hills Education.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

Course Outcomes:
On completion of this course, students are able to:
1. Use the knowledge of numerical analysis to find the root and interpolating polynomial.
2. Solve various differentiation and integration by numerical methods. Solve the first order ordinary

differential equation by the concept of Numerical analysis
3. Increase the knowledge about the complex plane and complex functions
4. Solve various integrations by the help of complex analysis.
--------- N.B: The course is of 3 credits with 4 contact hours ---------

22CM3HS01T	OrganisationalBehaviour(3-0-0)	Credit :3

Course Objectives:

1. Developing an understanding of the behaviour of individuals and groups insideorganizations by enhancing the skills in appreciating individual, interpersonal, andgroup processes for increase.
2. Developing effectiveness both within and outside of organizations is the goal of anyorganisation.
3. Through this course students will develop theoretical and practical insights.
4. The students will develop problem-solving capabilities for effectively managing theorganizational processes.

Course Outcomes:

1. Students will understand the essential of maintaining the inter-personal relationships inorganisations.
2. Personality factors will be effectively used to understand the communication amonggroups.
3. The reasons for conflict will be known and prescriptive methods can be devised to enhance higher productivity in organisations.
4. Being an employee in an organisation the importance of organisational change and culture can be known to all.

Module-I: Fundamentals of OB (6 Hours)
Introduction: Definition, nature and scope of OB (environmental and organizational context), Relationship between OB and the individual, Impact of IT, globalization and diversity on OB.

Module-II: Foundations of Individual Behaviour (10 Hours)
Personality: Meaning and definition, Determinants of personality, Personality traits, Personality and OB. Perception: Meaning and definition, Perceptual process, Importance of perception in OB. Motivation: Nature and importance, Herzberg's Two Factor Theory, Maslow's Need Hierarchy Theory, Alderfer's ERG Theory. Attitude: Definition, nature and dimensions, Attitude and OB.Learning: Nature, learning and OB.

Module-III: Group Dynamics of OB-I (8 Hours)
Communication: Types, interactive communication in organizations, barriers to communication, strategies to improve the follow of communication. Stress and Conflict: Meaning and types of stress, Meaning and types of conflict, Effect of stress on individuals, strategies to cope with stress and conflict.

Module-IV Group Dynamics of OB-II (6 Hours)
Power and Politics: Meaning and types of power empowerment. Groups Vs. Teams- Nature of groups, dynamics of informal groups, dysfunctions of groups and teams, teams in modern work place.

Module-V Foundations of Organizational Behaviour (6 Hours)
Organizational Culture: Culture and organizational effectiveness. Organizational Change: Types of change, reasons to change, resistance to change.Organisational Structure and Development:Concepts and process.

Text Book:

[1] Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.

Reference Books:

[2] Understanding Organizational Behaviour, Parek, Oxford
[3] Organizational Behaviour, Hitt, Miller, Colella, Wiley
[4] Organizational Behaviour, K. Awathappa, HPH.
[5] Organizational Behaviour, VSP Rao, Excel
[6] Understanding Organizational Behaviour, Parek, Oxford

22CM3HS02T	Engineering Economics and Costing (3-0-0)	Credit :3

Course Objectives:

At the end of the course the engineering students will be able:

1. To prepare engineering students to understand the basic concepts of Engineering economics and their application.
2. To carry out numerically the effects of changes in demand and supply on price determinations of products and services.
3. To justify or reject alternative projects in the light of changing domestic and global scenario on the eve of technological innovations.
4. To analyse the macroeconomic environment and financial system of the country and its impact on business society and enterprise.

Course Outcomes:

1. Students will understand how to solve economic problems and the art of taking the rightdecision on scarce resources.
2. This will help to solve different microeconomic problems related to production, cost, andrevenue maximization
3. Students will be understood different market structures and levels of competition anddetermine the price
4. This will help engineering students while evaluating and determining the cost of aproject. This is also helpful in determining the value of money for future courses ofaction.
5. This will help to understand basic microeconomic concepts like inflation, nationalincome, and money market.

Module-I: (10 Hrs.)
Engineering Economics: Nature and Scope, Basic Problems of an Economy, Micro and Macro Economics; Demand: Meaning of demand, Determinants of demand, Demand function, Law of demand and its exceptions, Elasticity of demand and its measurement, (Simple numerical problems to be solved). Supply: Meaning of Supply, Determinants of Supply, Supply function, Law of Supply and its exception, Elasticity of Supply.

Module-II: (7 Hrs.)
Production: Factors of Production, Production Function; Laws of Returns: Law of Variable Proportions, Law of Returns to Scale, Cost and Revenue Concepts: Short Run Total Costs, Long Run Average Cost Curves, Total Revenue, Average Revenue and Marginal Revenue,

Module-III: (6 Hrs.)
Market Structures: Basic understanding of different Market Structures; Determination of Equilibrium Price under Perfect Market Competition and Monopoly. Margin of safety and Break Even Analysis: Linear Approach (Simple numerical problems to be solved).

Module-IV: (10 Hrs.)
Time Value of Money: Interest- Simple and Compound, Nominal and Effective Rate of Interest, Cash flow diagrams, Principles of Economic Equivalence, Evaluation of Engineering Projects:
Present, Future and Annual worth Method, Rate of Return Analysis; Cost-Benefit Analysis

Module-V: (7 Hrs.)
Inflation: Meaning of Inflation, Types, Causes and Measures to Control Inflation. National Income: Definition, Concepts of National Income and its measurement, Banking: Commercial Bank, Functions of Commercial Bank, Central Bank, Functions of Central Bank.
Text Books:

1. Principles of Economics: DevigaVengedasalam& Karun agaranMadhavan-Oxford Publication

Reference Books:

1. Engineering Economics and Costing: D.M.Methani& Suresh Chandra Das-Himalaya Publishing House
2. Engineering Economics and Costing: Sasmita Mishra-PH Learning Private Limited
3. R.Panneerselvam, 'Engineering Economics', PHI
4. Riggs,Bedworth and Randhwa, 'Engineering Economics', McGrow Hill Education India
5. Engineering Economics and Costing: Mahendra P. Agasty, Scitech Publications (INDIA) Pvt. Ltd.

22CM3ES01T	Data Structures using C (3-0-0)	Credit :3

Course Objective:

1. Implementation of different linear data structure.
2. Implementation of non-linear data structures like trees and graphs.
3. Applying different sorting and searching algorithms.

Module-I: **[10 Hrs]**

Abstract Data Types – Definition and Representation, ADT of rational number, ADT of Stack, Data Structure and ADT. Stack and its usages: reversing string, matching parentheses, in fix to postfix, decimal to binary number. Queue: linear & circular queue, Deque& Applications. Matrix – sparse and dense.Representation of sparse matrix, Transpose & addition of sparse matrices.

Module-II: **[8 Hrs]**

Linked list and its representation: using array, using self referential structure. Singly, circular and double linked lists. Operations on linked list – Insertion, Deletion, Traversals. Usages of Linked list – insertion sort, Addition/multiplication of polynomials. Addition/Multiplication of large numbers.

Module-III: **[12 Hrs]**

Tree: Definition and Terminologies, child and parent nodes, Sub tree, root, leaf node, internal node, height of a tree. Binary, ternary, quad tree. Binary tree traversals. Reconstruction of binary tree from traversals. Binary search tree – inserting a new key, deleting a key, searching a key. AVL tree – inserting a new key into an AVL tree using rotations. B- tree : insertion and deletion using node splitting and merging.

Module-IV: **[6 Hrs]**

Sorting and Searching: Bubble sort, selection sort quick sort and merge sort. Linear and binary search, Fibonacci search.

Module-V: **[6 Hrs]**

Basic Graph Algorithm: Graph representation – adjacency matrix and list – pros and cons. Graph traversals – Depth First Search and Breadth First Search.

Course Outcome:

1. Apply the basic data structure like stack, queue, linked list, tree and graph on different problems.
2. Compare and differentiate different implementation of data structure.
3. Analyzing the time complexity and space complexity of different sorting and searching algorithms and data structures implementation.

Text Books:

1. Data Structures: A Pseudocode Approach with C – Gilberg&Forouzan, 2nd Edition, Cengage, Indian Reprint 2016
2. Data Structures and Program Design in C – Kruse, Leung, 2nd Edition, Pearson,2008.

Reference Books:

3. Data Structures Using C - YedidyahLangsam& Moshe J. Augenstein Aaron M. Tanenbaum, 3rd Edition, Pearson, 2009
4. Algorithms and Data Structures: The basic toolbox, Kurt Mehlhorn and Peter Sanders, Springer, 2010
5. Programming and Data Structures (NPTEL) – (Vodeo lectures by Dr. Naveen Garg, IIT

22CT3ES02T	**Digital Logic Design (3-0-0)**	**Credit :3**

COURSE OBJECTIVE:

1. To provide insight about the requirement of designing low cost and high speed Digital systems.
2. To gain inclusive knowledge about combinational and sequential logic blocks.
3. To get the idea of designing complex digital circuits.
4. To acquire fundamental knowledge about memory and their application towards synchronous sequential circuit.
5. To illustrate the operation of semiconductor memories and IC logic and their implementation towards different applications.

MODULE-I (12 Hours)

Digital Fundamentals and Binary Codes:

Revision of Number systems and their conversion, Signed Binary representation, Arithmetic Operation using 1's and 2`s Complements, Binary codes(Gray and BCD), Min-terms and Max-terms, Canonical Logic Forms, Extracting Canonical Forms, Function implementation: Using basic logic gates, Using only universal gates, K-Maps: Two, Three and Four variable K-maps.

MODULE-II (12 Hours)

Combinational Logic Design:

Arithmetic Circuits:Half Adder, Full Adder, Half Subtractor, Full Subtractor, Binary Parallel Adder, Multiplier, Magnitude Comparator.

Logic Circuits:Gray to Binary and Binary to Gray Code Converters, Multiplexer, De-Multiplexer, Decoder, Encoder, Priorityencoder

MODULE-III (6 Hours)

Fundamentals of Sequential Circuits: Storage elements, Latches(SR and D), Flip-Flops, Analysis of Flip-Flops: Functional Table, Characteristic Table, Characteristic Equation, State Diagram, Excitation Table, Timing Diagram, Positive-Edge-Triggered D Flip-Flop, Master-Slave JK-FF, Flip-Flop conversions.MODULE-IV (8 Hours)

Shift Registers: Shifting of Binary Bits, SISO, SIPO, PISO, PIPO, Ring Counter, Johnson Counter.

Sequential Circuits Design: Design Procedure, Counter: Asynchronous and Synchronous Counter, FSM Fundamentals: Melay and Moore Machines.

MODULE V (6 Hours)

Semiconductor Memory: Types of Memory, Memory Decoding, ROM, RAM (1-bit SRAM and D-RAM)

COURSE OUTCOMES:

1. Acquire fundamental knowledge about Digital electronics and the simplification of logic function using Boolean laws and mapping methods.
2. Understand the behavior of combinational arithmetic and logic circuits for development of complex digital systems
3. Acquire fundamental knowledge about the operation of basic memory elements and their application for designing synchronous sequential circuits.
4. Understand the function of IC logic families and basic memory blocks that helps to design complex Integrated circuits.

TEXT BOOKS:

1. M. Morris Mano, Michael D Ciletti, *Digital Design*, 5th Edition, Pearson Publication, 2016, New Delhi.

REFERENCE BOOKS:

1. Donald P Leach, Albert Paul Malvino, GoutamSaha ,*Digital Principles And Applications*, 8th Edition ,Tata McGraw Hill Education, 2015, New Delhi.

2. AAnand Kumar, *Fundamentals of digital circuits*, 4th edition, PHI, 2016, New Delhi.
3. T.L. Floyd and R.P. Jain, *Digital Fundamentals*, 7th Edition, Pearson Education, 2005, Bangalore
4. Norman Balabanian& Bradley Carlson, *Digital Logic Design Principles*, 2nd edition, John Wiley & Sons, 2004, New York.

WEB SOURCE REFERENCES:

1.	NPTEL, A Project funded by MHRD, Govt. of India https://nptel.ac.in/courses/117103064/	Study material
2.	Lecture Series on digital circuit and system by Prof. S. Srinivasan, Department of Electrical Engineering, IIT Madras. https://nptel.ac.in/courses/117106086/	Video lecture

22CT3PC01T	Database Engineering (3-0-0)	3 Credit

Course Objective:

1. Introducing basic database concepts like ERDiagram, Relational Algebra,
2. Designing Normalized databases
3. Advantages, disadvantages and implementation of NoSQL database design in contrast to SQL based database.
4. Introducing database transactions

Module-I: **[7 Hrs]**

Introductory concepts of DBMS: Introduction and applications of DBMS, Purpose of data base, Data, Independence, Database System architecture- levels, Mappings.

Entity-Relationship model: Basic concepts, Design process, constraints, Keys, Design issues, E-R diagrams, weak entity sets. Reduction to E-R database schema.

Module-II: **[7 Hrs]**

Database Programming: Relational Algebra and calculus (Domain and Tuple relational calculus) Basics of SQL, DDL,DML,creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, Functions - aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types. Transaction control commands – Commit, Rollback, save point. Concepts, Cursors, Stored Procedures, Stored Function, and Database Triggers.

Module-III: **[13 Hrs]**

Normalization of **Databases**:

Functional Dependency – definition, trivial and non-trivial FD, closure of FD set, closure of attributes, irreducible set of FD, Normalization – 1NF, 2NF, 3NF, Decomposition using FD- dependency preservation, BCNF, Multi- valued dependency, 4NF, Join dependency and 5NF.

Module-IV: **7 Hours**

Transaction Management: Transaction concepts, properties of transactions, serializ-ability of transactions, testing for serializability, System recovery, Two- Phase Commit protocol, Recovery and Atomicity, Log-based recovery, concurrent executions of transactions and related problems, Locking mechanism, solution to concurrency related problems, deadlock, two-phase locking protocol.

User security, grants, privileges, roles, access control.

Module-V: **[10 Hrs]**

Performance tuning and introduction to NOSQl

Overview of NOSQL databases, measures of query cost, selection operation, sorting, join. Performance Tuning Overview, Basic Tuning Tools, Using Statspack, Identifying Problem SQL **Statements**, Query Optimization

Influencing the Optimizer (Indexes (B-tree, Bitmap, Function Based indexes and reverse key indexes).

Course Outcome:

1. Designing database solutions for different real life problems
2. Write efficient and optimised SQL queries
3. Designing and differentiating solutions using schema based database and NoSQL database methods.

22CS3PC02T	Computer Network and Data Communication (3-0-0)	3 Credit

Course Objective:

1. Understand the concepts of data communication, layered model, wireless devices in computer networks.
2. Explain the various techniques used to access a shared channel in the network and IEEE specifications for LANs.
3. List types of networking devices, backbone networks and Internet Protocol (IP)addressing.
4. Explain the responsibilities of network, transport and application layers.

Module – I **[12 Hrs]**

Overview of Data Communication Networks, Protocols and standards, OSI Reference model, TCP/IP Protocol.
Physical Layer: Analog Signals, Digital Signals, Data Rate Limits, Transmission Impairment, Data rate limit, Digital Transmission: Digital-to-Digital conversion, Analog-to-Digital conversion, Transmission modes, Analog Transmission: Digital-to-Analog conversion, Analog-to-Analog conversion, Multiplexing: Frequency Division Multiplexing (FDM), Wave Division Multiplexing (WDM), Time Division Multiplexing (TDM), Transmission Media: Guided Media (Twisted-Pair Cable, Coaxial Cable and Fiber-Optic Cable) and unguided media (wireless), Switching: Circuit Switched Network, Datagram Network, Virtual-Circuit Network , Telephone Network, Dial-up Modems and Digital Subscriber Lines.

Module – II **[12 Hrs]**

Error Detection and correction: Types of Errors, Error Detection mechanism (Linear codes, CRC, Checksum), Error Correction mechanism: Hamming Encoding. Data Link Control and Protocols: Flow and Error Control, Stop-and-Wait ARQ. Go-Back-N ARQ, Selective Repeat ARQ, HDLC and Point-to-Point Protocol Multiple Access: Random Access (ALOHA, CSMA, CSMA/CD, CSMA/CA), Controlled Access (Polling, Reservation, Token Passing), Channelization (FDMA, TDMA, CDMA). Wired LANs (Ethernet): Traditional Ethernet, Fast Ethernet, Gigabit Ethernet.

Module – III **[6 Hrs]**

Wireless LANs: IEEE 802.11 and Bluetooth.
Connecting Devices: Passive Hub, Repeater, Active Hub, Bridge, Two layers Switch, Router, Three layers Switch, Gateway.
Virtual Circuit Networks: Frame Relay, Architecture & layers, ATM: Design goals, Architecture & layers.

Module – IV **[6 Hrs]**

Network Layer: IPV4 addresses, IPV6 addresses, Internet Protocol: Internetworking, IPV4 datagram, IPV6 packet format and advantages. Network Layer Protocols: ARP, RARP, IGMP and ICMP. Routing: Unicast Routing Protocols and Multicast Routing Protocols.
Transport Layer: Process to Process Delivery, User Datagram Protocol (UDP) and Transmission Control Protocol (TCP).

Module – V **[4 Hrs]**

Domain Name System (DNS): Name Space, Domain Name Space, DNS in Internet, Resolution and Dynamic Domain Name System (DDNS), Remote logging, Electronic Mail (SMTP) and file transfer

(FTP), WWW: Architecture & Web document, HTTP: Transaction & Persistent vs. Non-persistent connection. Introduction to Wi-Fi and Li-Fi Technology.

Course Outcome:

1. Explain computer network reference models, networking devices and different transmission techniques.

2. Reason the need for flow and error control at the data link layer and explain the associated protocols; enumerate the shared channel access methods, associated protocols and Wired LAN standards and implementations.
3. Explain how network layer, transport layer and application layer facilitates the transfer of message from one node to another in a global network.

Text Books and Online Resources:

1. Data Communications and Networking, Behrouz A. Forouzan, Tata McGraw-Hill, 5th Edition(2013).
2. Computer Networks, A. S. Tannenbum, D. Wetherall, Pearson Education, 5th Edition(2014).
3. Data and Computer Communications, William Stallings, Pearson Education, 10th Edition(2018).
4. Computer Networking, A Top-Down Approach, James F. Kurose, Keith W. Ross, Pearson publication, 6th Edition(2017).
5. http://www.nptelvideos.in/2012/11/computer-networks.html, Prof. Sujoy Ghosh, IIT, Kharagpur.
6. https://nptel.ac.in/courses/106105183/, Prof. SoumyaKantiGhosh, IIT, Kharagpur.
7. https://www.classcentral.com/course/stanford-openedx-introduction-to-computer-networking-1578, Prof. Philip Levis and Professor Nick McKeown, Stanford University.

22CM3MC01T	**Environmental Science and Engineering (3-0-0)**	**0 Credit**

Course Objectives

1. To provide insight about impact of the humans activities on environment and impact of environment on the humans & its health.
2. To understand the basic problem of anthropogenic environmental pollution
3. To gain comprehensive knowledge about the social problem arising out of industrialization.
4. To familiarize with the environmental ethics and act related to environment

Module – I:

Ecosystem Ecological Concepts and Natural Resources:

Ecological perspective and value of environment. Ecosystem: Concept, structure & Function of ecosystem; Energy cycle, Food Chain, & Food Web; Ecological pyramid, types; Biodiversity; Ecological Succession: Type of ecosystems: Forest, Grassland, Desert and Aquatic. Geochemical Cycles: Water, Carbon, Oxygen and Nitrogen cycles. Environmental gradients, Tolerance levels of environment factor, Indian Environmental Law; Environmental Auditing; Environment Impact Assessment (EIA): Origin and procedure, Project Screening.

Module – II

Water pollution and Treatment Water quality standards and parameters:

Assessment of water quality.Types, sources and consequences of water pollution.Ground water Contamination.Water table and Aquifer, Ground water recharge. Water Treatment Processes: Pre-treatment, Conventional and Advanced processes. Waste Water Treatment: DO and BOD of waste water, pretreatment, primary and secondary treatment. Activated sludge treatment (preliminary idea only).

Module – III

Air Pollution Air pollution and pollutants, criteria & non-criteria pollutants. Acid rain, Green house gases, Ozone layer depletion, Smog. Industrial Air Emission Control: Flue gas desulphurization, NOx removal. Methods for control of particulate matters (Mechanical device, Fabric Filtration, scrubber, Electrostatic precipitator). Noise Pollution: Physical Properties of sound, Noise criteria, Noise Standards, Noise measurement, Noise control.

Module – IV

Solid Waste Management Municipal Solid Waste (MSW):

Source, classification and Composition. MSW Management : Properties, separation, storage and transportation. Waste minimization of MSW, Reuse and Recycling. Hazardous Waste Management (HWM): Generation and Transportation. Treatment of hazardous waste: Incinerators, Inorganic

treatment, Handling of treatment plant residue. Waste minimization techniques.

Module – V

Occupational Safety and Health Acts Safety procedures, Type of Accidents, Chemical and Heat Burns, Prevention of Accidents involving Hazardous substances, Human error and Hazard Analysis. Hazard Control Measures in integrated steel industry, Petroleum Refinery, L.P.G. Bottling, Pharmaceutical industry. Fire Prevention: Detection, Extinguishing Fire. Electrical Safety, Product Safety. Personal Protective Equipment.

22CM3ES01L	Data Structure using C Laboratory (0-0-2)	1 credit

Prerequisites Programs:

1. Create a structure that stores a point in 2D. Accept 3 such points and find out the area of the triangle enclosed by these three points.
2. One array of numbers to be sorted. The no of element of the array is an user input. Create the array dynamically, accept its members and sort the array.

Programs for Evaluation Lab:

1. **(Integer stack simulation)** Write a structure for an integer stack, implement function push, pop, and pick, IsEmpty and IsFull function. Write a main function and call the functions based on an option entered.

2. **(Palindrome checking using stack)** Implement a stack of characters and create mystack.h. Write a program to check whether an entered string is a palindrome or not. One need to include mystack.h for calling the functions of character stack.

3. **(Simulating circular queue)** Defining structure of a circular queue (with a counter), write functions for inserting, deleting and counting no of elements present in the queue. Write functions IsFull and IsEmpty also. Write main function to call them.

4. **(Infix to Postfix)** Write a program to convert an infix expression into its corresponding postfix expression. The expression contains alphabets, operators and parentheses. During the conversion all possible checks for the correctness should be checked. [(a+b)/(c-d) would output ab+cd-/, ((a+b)^c-d would give error as "unmatched parenthesis]

5. **(Insertion sort)** A singly linked list gives a better way to implement insertion sort. A flat file contains some unknown number of integers. Implement insertion sort using a singly linked list that reads the next integer from the file and insert it into a linked list in its proper position. Write a function that prints the list after all elements is properly inserted into the linked list.

6. **(Polynomial addition)** Represent a polynomial of a single variable using a singly linked list. Write functions createPolynomial that stores one polynomial in a singly linked list. Write a function to add two such linked lists.

7. **(BST simulation)** Declare a binary search tree where information at each node would be a single integer. Write functions for inserting a key, deleting a key from the tree. Write recursive traversal routines. After each insertion/deletion find all traversal results.

8. **(Bubble sort)** One array of numbers to be sorted. The no of element of the array is a user input. Create the array dynamically, accept its members and sort the array using bubblesort algorithm. Also count the total number of swaps.

9. **(Quick sort)** Write a function to implement recursive quick sort algorithm and using this function sort an array of integers. Write another function to search for a key in this sorted array using binary search.

10. **(Merge Sort)** Implement recursive merge sort using an array of fixed size and hence sort an array of double numbers using this function.

22CT3ES02L	Digital Logic Design Laboratory (0-0-2)	1 Credit

COURSE OBJECTIVE:

1. Understand the uses of basic digital integrated circuits .

2. To be familiar with design and testing of various combinational circuits.

3. To know the design, implementation and debugging of sequential circuits.

List of Experiments:

1. Digital Logic Gates: Investigate logic behavior of AND, OR, NAND, NOR, EX-OR, and Inverter gates.
2. Gate-level minimization: Two level and multi-level implementation of Boolean functions.
3. Design and Testing of combinational circuits: Half-Adder, Half-Subtraction, and Full Adder.
4. Design of binary to Gray, Gray to Binary Code Converter, and Seven Segment Display Decoder.
5. Design and implementation of 2-bit Binary Multiplier
6. Testing of Multiplexer and function implementation using suitable Multiplexer.
7. Testing of Decoder and function implementation using suitable Decoder.
8. Testing of basic SR Latch and FFs: D-FF, JK-FF
9. Design and Testing of SISO, SIPO Shift Registers
10. Design and testing of 3-bit binary Asynchronous UP-Counter and Modulo-6 counter.

COURSE OUTCOME:

1. Access knowledge about various fundamental digital Integrated circuits and bread board.

2. Design combinational circuits using different logic gates, Multiplexer and decoder.

22CT3PC01L	Database Engineering Laboratory (0-0-2)	1 Credit

List of Experiments:

List of Experiments:

1. Retrieving Data Using the SQL SELECT Statement.
2. Restricting and Sorting Data.
3. Manipulating Data.
4. Using DDL Statements to Create and Manage Tables.
5. Using Single-Row Functions to Customize Output.
6. Reporting Aggregated Data Using the Group Functions.
7. Displaying Data from Multiple Tables.
8. Using Sub queries to Solve Queries.
9. Creating Other Schema Objects (indexes, views).
10. User security (privileges, roles).
11. Cursors and composite data types...
12. Functions and procedures.
13. Packages.
14. Triggers.
15. Mini project (Application Development)

Text Books:

Murach's MySQL: Joel Murach , 2nd Edition.

22CT3PC02L	Computer Network and Data Communication Laboratory (0-0-2)	1 credit

Experiment-1. Introduction to LAN hardware and IP addresses configuration
Experiment-2. Understanding and use of networking tools: ifconfig, ping, traceroute, arp, dig and nslookup
Experiment-3. Configuration of CISCO Switches and Routers.
Experiment-4. Study of network traffic using Wireshark filters.**Experiment-5.** Controlling of network scenario using Netam and tc. **Experiments- 6 to 8** are based on the following experiments:

1. Simulate a three node point to point network with duplex links between them. Set queue size and vary the bandwidth and find number of packets dropped.
2. Simulate a four node point to point network with the links connected as follows: n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0 – n3 and UDP agent between n1 – n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP / UDP.
3. Simulate the transmission of ping messages over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
4. Simulate an Ethernet LAN using 'n' nodes, change error rate and data rate and compare throughput.
5. Simulate an Ethernet LAN using 'n' nodes and set multiple traffic nodes and plot congestion window for different source / destination.

Experiments- 9 to 10 are based on the following experiments to be implemented in C/Java:

1. Implementation of Distance Vector Algorithm to find suitable path for transmission.
2. Program for ERROR detecting code using CRC-CCITT (16bit).
3. Using TCP/IP Sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.
4. Program for CLIENT SERVER communication using message Queues or FIFOs as IPC channels that client sends the file name and the server to send back the contents of the requested file if present.
5. Program for Congestion control using Leaky Bucket Algorithm.