School of Information Technology
Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal
New Scheme of Examination as per AICTE Flexible Curricula
Syllabus I Semester
B.Tech Computer Science and Engineering (Data Science)

CD-101 (INTRODUCTORY TOPICS IN STATISTICS, PROBABILITY AND CALCULUS)

Unit I- Introduction to Statistics: Definition of Statistics, Basic objectives, Applications in various branches of science with examples, Collection of Data: Internal and external data, Primary and secondary Data, Population and sample, Representative sample.

Unit II- Descriptive Statistics: Classification and tabulation of univariate data, graphical representation, Frequency curves, Descriptive measures - central tendency and dispersion, Bivariate data, Summarization, marginal and conditional frequency distribution.

Unit III- Probability: Concept of experiments, sample space, event, Definition of Combinatorial Probability, Conditional Probability, Bayes Theorem.

Unit IV- Probability distributions: Discrete& continuous distributions, Binomial, Poisson and Geometric distributions, Uniform, Exponential, Normal, Chi-square, t, F distributions. Expected values and moments: mathematical expectation and its properties, Moments (including variance) and their properties, interpretation, Moment generating function.

Unit V- Calculus: Basic concepts of Differential and integral calculus, application of double and triple integral.

Text Books-

1. Introduction of Probability Models, S.M. Ross, Academic Press, N.Y.
2. Fundamentals of Statistics, vol. I & II, A. Goon, M. Gupta and B. Dasgupta, World Press.
3. Higher Engineering Mathematics, B. S. Grewal, Khanna Publication, Delhi.

Reference Books-

1. A first course in Probability, S.M. Ross,Prentice Hall.
2. Probability and Statistics for Engineers,(Fourth Edition), I.R. Miller, J.E. Freund and R. Johnson, PHI.
3. Introduction to the Theory of Statistics, A.M. Mood, F.A. Graybill and D.C. Boes,McGraw Hill Education.
4. Advanced Engineering Mathematics, (Seventh Edition), Peter V. O'Neil, Thomson Learning.
5. Advanced Engineering Mathematics, (Second Edition) M. D. Greenberg, Pearson Education.
6. Applied Mathematics, Vol. I & II, P. N. Wartikar and J. N. Wartikar,Vidyarthi Prakashan.

Course Outcomes-

On successful completion of the course, the students will be able to:

CO1: Analyze data using various statistical methods
CO2: Understand graphical representation of data
CO3: Understand the concepts of probability and random variables and apply it in solving real world problems
CO4: Model and solve real life problems using various discrete and continuous distributions
CO5: Apply the knowledge of differential calculus in optimizing functions of single variables

CD-102 (BASIC COMPUTER ENGINEERING)

UNIT I- Computer: Definition, Classification, Organization i.e. CPU, processor, Bus architecture, Memory Hierarchy & Storage Systems, I/O Devices, System & Application Software; Computer Application in e-Business, Bio-Informatics, health Care, Remote Sensing & GIS, Meteorology and Climatology, Computer Gaming, Multimedia and Animation etc. Operating System: Definition, Functions, Types, Introduction to MS word, MS powerpoint, MS Excel

UNIT II- Introduction to Algorithms, Flowchart, Introduction to Programming, Machine language, assembly language and high level language, Categories of Programming Languages, Program Design, Programming Paradigms, Procedure Oriented Programming VS object oriented Programming, Introduction to Character Set, Tokens, Precedence and Associatively, Program Structure, Data Types, Variables, Operators, Expressions, Statements and control structures, I/O operations, Functions

UNIT III- Introduction to Data Structures, Types of data structures and their applications

UNIT IV- Computer Networking: Introduction, Goals, Internetworking Concepts, Devices, Introduction to Internet, World Wide Web, IP address, LAN, MAN, WAN, Network Topology, E-commerce, Computer Security Basics: Introduction to viruses, worms, malware, Trojans, Spyware and Anti-Spyware Software, Different types of attacks like Money Laundering, Information Theft, Email spoofing, Denial of Service (DoS), Cyber Stalking, ,Logic bombs, Hacking Spamming, Cyber Defamation , pharming; Security measures Firewall, Computer Ethics & Good Practices, Introduction of Cyber Laws about Internet Fraud, Good Computer Security Habits

UNIT V- Data Base Management System: Introduction, File oriented approach and Database approach, Architecture of Database System, DBA, centralized and distributed database, Data definition language and Manipulation Languages. Cloud computing: definition, cloud infrastructure, cloud segments or service delivery models (IaaS, PaaS and SaaS), cloud deployment models/ types of cloud (public, private, community and hybrid clouds), Pros and Cons of cloud computing

Reference Books-

1. Fundamentals of Computers : E Balagurusamy, TMH
2. Fundamentals of Computers : V Rajaraman, PHI
3. Information Technology Principles and Application: Ajoy Kumar Ray & Tinku Acharya PHI.
4. Introduction of Computers : Peter Norton, TMH
5. Object Oriented Programming with C++ :E.Balagurusamy, TMH
6. Concepts in Computing: Kenneth Hoganson, Jones & Bartlett.
7. Operating Systems – Silberschatz and Galvin - Wiley India
8. Computer Networks:Andrew Tananbaum, PHI
9. Data Base Management Systems, Korth, TMH
10. Cloud Computing, Kumar, Wiley India

Course Outcomes-

On successful completion of the course, the students will be able to:

CO1: Explain the components of a computer system
CO2: Develop algorithms and flowcharts for given problems
CO3: Understand the application of data structures in various problems
CO4: Apply the knowledge of computer networking and Network security while using computers
CO5: Create databases for given attributes

Suggested List of Experiments-

1. Demonstration of Computer Hardware
2. Installation of various software

3. Algorithm and flowcharts of simple problems
4. Structured code writing

CD-103 (PRINCIPLES OF ELECTRONICS)

Unit I- Semiconductors: Crystalline material: Mechanical properties, Energy band theory, Fermi levels; Conductors, Semiconductors and Insulators: electrical properties, band diagrams. Semiconductors: intrinsic and extrinsic, energy band diagram, P-type and N-type semiconductors, drift and diffusion carriers.

Unit II- Diodes and Diode Circuits: Formation of P-N junction, energy band diagram, built-in-potential forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance and Varactor diode. Simple diode circuits, load line, linear piecewise model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation

Unit III- Bipolar Junction Transistors: Formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode, transistor action, injection efficiency, base transport factor and current amplification factors for CB and CE modes. Biasing and Bias stability: calculation of stability factor
Field Effect Transistors: Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles

Unit IV- Feed Back Amplifier, Oscillators and Operational Amplifiers: Concept (Block diagram), properties, positive and negative feedback, loop gain, open loop gain, feedback factors; topologies of feedback amplifier; effect of feedback on gain, output impedance, input impedance, sensitivities (qualitative), bandwidth stability; effect of positive feedback: instability and oscillation, condition of oscillation, Barkhausen criteria. Introduction to integrated circuits, operational amplified and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Adders, Subtractors, Constant-gain multiplier, Voltage follower, Comparator, Integrator, Differentiator

Unit V- Digital Electronics: Introduction to binary number; Basic Boolean algebra; Logic gates and function realization with OPAMPs

Reference Books-

1. Adel S. Sedra and Kenneth C. Smith, ―Microelectronic Circuits: Theory and Application‖, 7th Edition, Oxford University Press, 2017.
2. Jacob millman, christoshalkiaschetanparikh,"Millman's Integrated Electronics "McGraw Hill education (India) private limited, 2009
3. M. Morris Mano," Digital Logic & Computer Design" Pearson India Educational Services PvT. Limited, 2016
4. Robert L. Boylestad, Louis Nashelsky,"Electronic Devices and Circuit Theory", Pearson India Educational Services PvT. Limited, 2015
5. Ben Streetman, Sanjay Banerjee," Solid State Electronic Devices",6th Edition, Prentice Hall of India, 2005
6. NPTEL online Course on ―Fundamentals of Semiconductor devices, Course Link: https://onlinecourses.nptel.ac.in/noc19_ee04/
7. https://www.electronics-tutorials.ws/ 8. https://circuitverse.org/

Course Outcomes-

On successful completion of the course, the students will be able to:
CO1: Understand the fundamentals of semiconductors.
CO2: Learn the principles of diodes and diode circuits.
CO3: Understand the principles of bipolar junction transistors and field eff ect transistors.
CO4: Learn the working principles of feedback amplifiers and oscillators.

CO5: Understand the working of operational amplifiers and digital electronic fundamentals

Suggested List of Experiments-

1. Study of V-I Characteristics of Diodes.
2. Applications of Diodes and their verification.
3. Transistor applications as amplifier and switch.
4. Verification of truth table for various gates, Flip-Flops.
5. Realizations of Various gates, Flip-Flops etc.
6. Verification of De Morgan's theorems.

CD-104 (FUNDAMENTALS OF PHYSICS)

Unit I- Oscillation: Periodic motion-simple harmonic motion-characteristics of simple harmonic motion-vibration of simple spring mass system. Resonance-definition., damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators.

Unit II- Interference-principle of superposition-young's experiment: Theory of interference fringes-types of interference-Fresnel's prism-Newton's rings, Diffraction-Two kinds of diffraction-Difference between interference and diffraction-Fresnel's half period zone and zone plate-Fraunhofer diffraction at single slit-plane diffraction grating. Temporal and Spatial Coherence.

Unit III- Polarization of light:Polarization - Concept of production of polarized beam of light from two SHM acting at right angle; plane, elliptical and circularly polarized light, Brewster's law, double refraction.

Basic Idea of Electromagnetisms: Continuity equation for current densities, Maxwell's equation in vacuum and non-conducting medium.

Unit IV- Quantum Mechanics: Introduction- Planck's quantum theory- Matter waves, de-Broglie wavelength, Heisenberg's Uncertainty principle, time independent and time dependent Schrödinger's wave equation, Physical significance of wave function, Particle in a one dimensional potential box, Heisenberg Picture.

Crystallography: Basic terms-types of crystal systems, Bravais lattices, miller indices,dspacing, Atomic packing factor for SC, BCC, FCC and HCP structures.

Semiconductor Physics: Conductor, Semiconductor and Insulator; Basic concept of Band theory.

Unit V- Laser and Fiberoptics: Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: Ruby Laser, CO2 and Neodymium lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in engineering.Fiber optics and Applications, Types of optical fibers.

Thermodynamics: Zeroth law of thermodynamics, first law of thermodynamics, brief discussion on application of 1st law, second law of thermodynamics and concept of Engine, entropy, change in entropy in reversible and irreversible processes.

Reference Books-

1. Concepts of Modern Physics, (Fifth Edition) A Beiser, McGraw Hill International.
2. Fundamentals of Physics, David Halliday, Robert Resnick and Jearl Walker, Wileyplus.
3. Optics, (Fifth Edition)AjoyGhatak, Tata McGraw Hill.
4. Sears &Zemansky University Physics, Addison-Wesley.
5. Fundamentals of Optics, (Third Edition)Jenkins and White, McGraw-Hill.

Course Outcomes-

On successful completion of the course, the students will be able to:
CO1: Understand the principles of interference and polarization of light.
CO2: Understand the principles lying behind crystallography and oscillations.
CO3: Understand the basics of electromagnetism and thermodynamics.
CO4: Learn the principles of semiconductor physics and quantum mechanics.
CO5: Learn the fundamentals of lasers and Fiber Optics principles.

Suggested List of Experiments-

1) Magnetic field along the axis of current carrying coil – Stewart and Gee

2) Determination of Hall coefficient of semi-conductor
3) Determination of Plank constant
4) Determination of wave length of light by Laser diffraction method
5) Determination of wave length of light by Newton's Ring method
6) Determination of laser and optical fiber parameters
7) Determination of Stefan's Constant.

CD-105 (COMMUNICATION SKILLS)

Unit I- Overview of LOL (include activity on introducing self), Class activity – presentation on favorite cricket captain in IPL and the skills and values they demonstrate Self-work with immersion – interview a maid, watchman, sweeper, cab driver, beggar and narrate what you think are the values that drive them, Overview of business communication
Activity: Write a newspaper report on an IPL match
Activity: Record a conversation between a celebrity and an interviewer
Quiz, Self-awareness – identity, body awareness, stress management

Unit II- Essential Grammar – I: Refresher on Parts of Speech – Listen to an audio clip and note down the different parts of speech followed by discussion, Tenses: Applications of tenses in Functional Grammar – Take a quiz and then discuss, Sentence formation (general & Technical), Common errors, Voices. Show sequence from film where a character uses wrong sentence structure (e.g. Zindagi Na Milegi Dobara where the characters use 'the' before every word)

Unit III- Communication Skills: Overview of Communication Skills, Barriers of communication, Effective communication, Types of communication- verbal and non – verbal – Role-play based learning, Importance of Questioning, Listening Skills: Law of nature- Importance of listening skills, Difference between listening and hearing, Types of listening, Expressing self, connecting with emotions, visualizing and experiencing purpose
Activity: Skit based on communication skills, Evaluation on Listening skills – listen to recording and answer questions based on them.

Unit IV- Email writing: Formal and informal emails, activity, Verbal communication: Pronunciation, clarity of speech, Vocabulary Enrichment: Exposure to words from General Service List (GSL) by West, Academic word list (AWL) technical specific terms related to the field of technology, phrases, idioms, significant abbreviations formal business vocabulary – Read Economic Times, Reader's Digest, National Geographic and take part in a GD, using the words you learnt/liked from the articles.
Group discussion using words learnt, Practice: Toastmaster style Table Topics speech with evaluation, Written Communication: Summary writing, story writing, Build your CV – start writing your comprehensive CV including every achievement in your life, no format, no page limit
Project: Create a podcast on a topic that will interest college students
Life skill: Stress management, working with rhythm and balance, colors, and teamwork
Project: Create a musical using the learning from unit

Unit V- Understanding Life Skills: Movie based learning – Pursuit of Happiness. What are the skills and values you can identify, what can you relate to Introduction to life skills, What are the critical life skills, Multiple Intelligences, Embracing diversity – Activity on appreciation of diversity, Life skill: Community service – work with an NGO and make a presentation, Life skill: Join a trek – Values to be learned: Leadership, teamwork, dealing with ambiguity, managing stress, motivating people, creativity, result orientation.

Reference Books-

1. English vocabulary in use – Alan Mc'carthy and O'dell
2. APAART: Speak Well 1 (English language and communication)
3. APAART: Speak Well 2 (Soft Skills)
4. Business Communication – Dr.Saroj Hiremath

Course Outcomes-

On successful completion of the course, the students will be able to:
CO1: Comprehend conversations and talks presented in English.
CO2: Use the acquired knowledge of essential grammer in forming sentences

CO3: Understand the basic tenets of communication
CO4: Demonstrate skills in email writing and verbal communication
CO5: Apply the life skills to different situations.

Suggested List of Experiments-
Various activities like Quiz, Skits, GD

CD-106 (COMPUTER PROGRAMMING I)

Unit I Introduction to Programming, Machine Level Languages, Assembly Level Languages, High Level Languages, Program Execution and Translation Process, Problem solving using Algorithms and Flowcharts. Introduction to C Programming: Data Types, Constants, Keywords, Operators & Expressions, Precedence of operators and input/output functions.

Unit II Control Statements and Decision Making: The goto statement, The if statement, The if-else statement, Nesting of if statements, The conditional expression, The switch statement, The while loop, The do…while loop, The for loop, The nesting of for loops, The break and continue statement.

Unit III Arrays, Strings & Pointers: One dimensional Arrays, Passing Arrays to Functions, Multidimensional Arrays, Strings, Basics of Pointers & Addresses, Pointer to Pointer, Pointer to Array, Array of Pointers, Types of pointers, Pointer to Strings.

Unit IV Functions & Structures: Function Basics, Function Prototypes, Passing Parameter by value and by reference, Passing string to function, Passing array to function, Function returning address, Recursion, Structures & Union, Pointer to Structure, Self-Referential Structures, Dynamic memory allocation by malloc/calloc function, Storage Classes.

Unit V File Handling: Defining and Opening a file, Closing Files, Input/output Operations on Files, Predefined Streams, Error Handling during I/O Operations, Command Line Arguments.

Reference Books-

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. Paul Deitel and Harvey M. Deitel, How to Program, Pearson Publication.
3. YashavantKanetkar , Let Us C, BPB publication.
4. E. Balagurusamy, Programming in ANSI C, Tata McGraw-Hill.
5. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.

Course Outcomes-

After completion of the course students would be able to:

CO1: Identify situations where computational methods and computers would be useful.
CO2: Describe the basic principles of imperative and structural programming.
CO3: Develop a pseudo-code and flowchart for a given problem.
CO4: Analyze the problems and choose suitable programming techniques to develop solutions.
CO5: Design computer programs to solve real world problems.

Suggested List of Experiments-

1. Algorithm and flowcharts of small problems like GCD
2. Structured code writing with:
   i. Small but tricky codes
   ii. Proper parameter passing
   iii. Command line Arguments
   iv. Variable parameter
   v. Pointer to functions
   vi. User defined header
   vii. Make file utility
   viii. Multi file program and user defined libraries
   ix. Interesting substring matching / searching programs
   x. Parsing related assignments

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CD- 201 (DISCRETE STRUCTURES)

Objective-This course introduces the applications of discrete mathematics in the field of computer science. It covers sets, logic, proving techniques, combinatorics, functions, relations, Graph theory and algebraic structures. These basic concepts of sets, logic functions and graph theory are applied to Boolean Algebra and logic networks while the advanced concepts of functions and algebraic structures are applied to finite state machines and coding theory.

Unit-I

Set Theory, Relation, Function, Theorem Proving Techniques : Set Theory: Definition of sets, countable and uncountable sets, Venn Diagrams, proofs of some general identities on sets Relation: Definition, types of relation, composition of relations, Pictorial representation of relation, Equivalence relation, Partial ordering relation, Job-Scheduling problem Function: Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions, pigeonhole principle. Theorem proving Techniques: Mathematical induction, Proof by contradiction.

Unit-II

Algebraic Structures: Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard results.

Unit-III

Propositional Logic: Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Normal Forms, Universal and existential quantifiers. Introduction to finite state machine Finite state machines as models of physical system equivalence machines, Finite state machines as language recognizers.

Unit-IV

Graph Theory: Introduction and basic terminology of graphs, Planer graphs, Multigraphs and weighted graphs, Isomorphic graphs, Paths, Cycles and connectivity, Shortest path in weighted graph, Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number, Isomorphism and Homomorphism of graphs.

Unit V

Posets, Hasse Diagram and Lattices: Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices. Combinatorics: Introduction, Permutation and combination, Binomial Theorem, Multimonial Coefficients Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive algorithms , Linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions , Generating functions, Solution by method of generating functions.

References:

1. C.L.Liu, “Elements of Discrete Mathematics” Tata Mc Graw-Hill Edition.
2. Trembley, J.P & Manohar; “Discrete Mathematical Structure with Application CS”, McGraw Hill.

3. Kenneth H. Rosen, “Discrete Mathematics and its applications”, McGraw Hill.
4. Bisht, “Discrete Mathematics”,Oxford University Press
5. Biswal,”Discrete Mathematics & Graph Theory”, PHI

Course Outcomes:

After completion of the course students would be able to:

CO1: Prove mathematical theorems using mathematical induction.
CO2: Understand sets and perform operations and algebra on sets.
CO3: Demonstrate an understanding of relations and functions and be able to determine their properties.
CO4: Understand groups, rings and fields.
CO5: Analyze logical propositions via truth tables.
CO6: Define graphs, digraphs and trees, and identify their main properties.
CO7: Evaluate combinations and permutations on sets.

CD-202 (STATISTICAL METHODS)

Unit I- Linear Statistical Models: Simple linear regression & correlation, multiple regression & multiple correlation, Analysis of variance (one way, two way with as well as without interaction)

Unit II- Estimation and Sufficient Statistic: Estimation: Point estimation, criteria for good estimates (un-biasedness, consistency), Methods of estimation including maximum likelihood estimation. Sufficient Statistic: Concept & examples, complete sufficiency, their application in estimation
Test of hypothesis: Concept & formulation, Type I and Type II errors, Neyman Pearson lemma, Procedures of testing,

Unit III- Non-parametric Inference: Comparison with parametric inference, Use of order statistics. Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test. Spearman‘s and Kendall‘s test. Tolerance region

Unit IV- Basics of Time Series Analysis & Forecasting: Stationary, ARIMA Models: Identification, Estimation and Forecasting.

Unit V- R statistical programming language: Introduction to R, Functions, Control flow and Loops, Working with Vectors and Matrices, Reading in Data, Writing Data, Working with Data, Manipulating Data, Simulation, Linear model, Data Frame, Graphics in R

Reference Books-

1. I.R. Miller, J.E. Freund and R. Johnson, “Probability and Statistics for Engineers” 9th Edition, Pearson.
2. A. Goon, M. Gupta and B. Dasgupta, ―Fundamentals of Statistics, vol. I & II, World Press.
3. Chris Chatfield, “The Analysis of Time Series: An Introduction, 6th edition, Chapman and Hall/CRC.
4. D.C. Montgomery &E.Peck, “Introduction to Linear Regression Analysis”, 5th edition, Wiley.
5. A.M. Mood, F.A. Graybill& D.C. Boes, ―Introduction to the Theory of Statistics, 3rd edition, McGraw Hill.
6. N. Draper & H. Smith, “Applied Regression Analysis‖, 3rd edition, Wiley.
7. Garrett Grolemund, “Hands-on Programming with R”, 1st edition, O′Reilly. 8. Jared P. Lander, “R for Everyone: Advanced Analytics and Graphics”, 2nd edition, Addison-Wesley Professional.

Course Outcomes-

On successful completion of the course, the students will be able to:
CO1: Understand various linear statistical models and acquire knowledge in hypothesis testing.
CO2: Apply methods of estimation in statistical analysis.
CO3: Understand Non-Parametric tests and its applications.
CO4: Design and forecast models using Tim series data.
CO5: Understand and apply R language in data visualization.

Suggested List of Experiments-

1. Use of various functions in R

2. R programming

CD-203 (DIGITAL LOGIC DESIGN)

Unit-I

Introduction to Digital Electronics, Needs and Significance, Different Number System: Binary Numbers, Octal and Hexadecimal Numbers, Conversions, Complement's, Signed Binary Numbers, Binary Arithmetic's, Binary Codes: BCD, ASCII Codes.

Unit-II

Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Boolean Relations, Digital Logic Gates, De Morgan's Theorem, Karnaugh Maps and simplifications.

Unit-III

Combinational Circuits, Half Adder, Full Adder, Binary Adder-Subtractor, Binary Multiplier, Comparator, Decoders, Encoders, Multiplexers, Programmable Devices: Programmable Logic Array (PLA), Programmable Array Logic (PAL).

Unit-IV

Sequential Circuits, Latches, Flip-Flops: RS Latches, Level Clocking, D Latches, Edge-triggered D Flip-flop, Edge-triggered JK Flip-flop, JK Master-slave Flip-flop; Registers, Shift Registers, Counters, Ripple Counters, Synchronous Counters.

Unit-V

Introduction to Memory, Memory Decoding, Error Detection and Correction, Sequential (or simple) programmable logic device (SPLD), Complex programmable logic device (CPLD), Field-programmable gate array (FPGA), Digital Logic Design: RTL and DTL Circuits, TTL, ECL, MOS, CMOS, Application Specific Integrated Circuits.

Reference Books-

1. M. Morris Mono, "Digital logic design", Pearson Education Pvt. Ltd.
2. A Anand Kumar, "Fundamentals of digital circuits", PHI Learning Pvt Ltd.
3. A K Maini, "Digital Electronics Principles and Integrated Circuits, Wiley India Pvt Ltd.
4. R P Jain, "Modern Digital Electronics", Tata McGraw-Hill publishing company Ltd.
5. D P Kothari and J S Dhillon, "Digital Circuits and Design", Pearson Education Pvt. Ltd.

Course Outcomes-

After the completion of this course, the students will be able to:

1. Perform number base conversions
2. Use Boolean logic to create digital circuits and reduce the Boolean functions to mitigate hardware complexity issues
3. Learn design of combinational circuits
4. Learn sequential circuits and use them in digital systems such as computers and communication systems
5. Compare and differentiate various memories used in Computers

Suggested List of Experiments-

1. Study and verify the operation of AND, OR, NOT, NOR and NAND logic gates.
2. Design all basic logic gates using NOR universal gate.
3. Design all basic logic gates using NAND universal gate.
4. Verification of Demorgan's theorem.
5. Construction and verification of half adder and full adder circuits.
6. Construction and verification of half subtractor and full subtractor circuits.
7. Design of Binary to Grey & Grey to Binary code Converters .
8. Design of BCD to excess-3 code converter.

CD-204 (OBJECT ORIENTED PROGRAMMING)

Unit I

Introduction: Object oriented programming, Introduction, Application, characteristics, difference between object oriented and procedure programming, Comparison of C and C++, Cout, Cin, Data Type, Type Conversion, Control Statement, Loops, Arrays and string arrays fundamentals, Function, Returning values from functions, Reference arguments, Overloaded function, Inline function, Default arguments, Returning by reference.

Unit II

Object and Classes: Implementation of class and object in C++, access modifiers, object as data type, constructor, destructor, Object as function arguments, default copy constructor, parameterized constructor, returning object from function, Structures and classes, Classes objects and memory, static class data, Arrays of object, Arrays as class Member Data, The standard C++ String class, Run time and Compile time polymorphism.

Unit III

Operator overloading and Inheritance: Overloading unary operators, Overloading binary operators, data conversion, pitfalls of operators overloading, Concept of inheritance, Derived class and base class, access modifiers, types of inheritance, Derived class constructors, member function, public and private inheritance.

Unit IV

Pointer and Virtual Function: Addresses and pointers, the address-of operator & pointer and arrays, Pointer and Function pointer, Memory management: New and Delete, pointers to objects, debugging pointers, Virtual Function, friend function, Static function, friend class, Assignment and copy initialization, this pointer, dynamic type information.

Unit V

Streams and Files: Streams classes, Stream Errors, Disk File I/O with streams, file pointers, error handling in file I/O with member function, overloading the extraction and insertion operators, memory as a stream object, command line arguments, printer output, Function templates, Class templates Exceptions, Containers, exception handling.

Reference Books-

1. E. Balaguruswami, ”Object Oriented Programming in C++”, TMH.
2. Robert Lafore, “Object Oriented Programming in C++”, Pearson.
3. M.T. Somashekare, D.S. Guru, “ Object-Oriented Programming with C++”, PHI.
4. Herbert Shildt, “The Complete Reference C++”, Tata McGraw Hill publication.

Course Outcomes-

After the completion of this course, the students will be able to:

1. Understand the key features of Object Oriented Programming and Methodology
2. Recognize attributes and methods for given objects.
3. Implement programs of inheritance and operator overloading
4. Understand and use concept of pointers, memory management and virtual functions in programs
5. Perform file handling in programs

Suggested List of Experiments-

1. Write a program to find out the largest number using function.
2. Write a program to find the area of circle, rectangle and triangle using function overloading.
3. Write a program to implement complex numbers using operator overloading and type conversion.
4. Write a program using class and object to print bio-data of the students.

5. Write a program which defines a class with constructor and destructor which will count number of object created and destroyed.
6. Write a program to implement single and multiple inheritances taking student as the sample base class.
7. Write a program to add two private data members using friend function.
8. Write a program using dynamic memory allocation to perform 2x2 matrix addition and subtraction.
9. Write a program to create a stack using virtual function.
10. Write a program that store five student records in a file.
11. Write a program to get IP address of the system.
12. Write a program to shutdown the system on windows operating system.

CD-205 (INTRODUCTION TO DATA ANALYTICS)

Unit I

Descriptive Statistics: Probability Distributions, Inferential Statistics, Inferential Statistics through hypothesis tests Regression & ANOVA, Regression ANOVA (Analysis of Variance).

Unit II

Different types of data analysis and the key steps in a data analysis process. Understanding of different components of a modern data ecosystem, and the role of Data Engineers, Data Analysts, Data Scientists, Business Analysts, and Business Intelligence Analysts play in this ecosystem. Role, responsibilities, and skillsets required to be a Data Analyst.

Unit III

Introduction To Big Data: Big Data and its Importance, Four V's of Big Data, Drivers for Big Data, Introduction to Big Data Analytics, Big Data Analytics applications.

Unit IV

Big Data Technologies: Hadoop's Parallel World, Data discovery, Open source technology for Big Data Analytics, cloud and Big Data, Predictive Analytics, Mobile Business Intelligence and Big Data, Crowd Sourcing Analytics, Inter- and Trans-Firewall Analytics, Information Management.

Unit V

Processing Big Data: Integrating disparate data stores, Mapping data to the programming framework, connecting and extracting data from storage, Transforming data for processing, subdividing data in preparation for Hadoop Map Reduce.

Reference Books-

1. Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.
2. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.1. Rajaraman, A., Ullman, J. D., Mining of Massive Datasets, Cambridge University Press, United Kingdom, 2012
3. Berman, J.J., Principles of Big Data: Preparing, Sharing and Analyzing Complex Information, Morgan Kaufmann, 2014
4. Barlow, M., Real-Time Big Data Analytics: Emerging Architecture, O Reilly, 2013
5. Schonberger, V.M. , Kenneth Cukier, K., Big Data, John Murray Publishers, 2013
6. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012.

Course Outcomes-

On successful completion of the course, the students will be able to:

CO1: Understand inferential statistics and its applications.

CO2: Identify role of various stakeholders in data analysis.

CO3: Understand the basic concepts of Big Data.

CO4: Recognize the concepts of Hadoop in business intelligence.

CO5: Apply Big Data processing methods.

CD-206 (Computer Programming II)
C++

UNIT I
Principles of Object Oriented Programming (OOP), Software Evaluation, A Look at ProcedureOriented Programming, OOP Paradigm, Basic Concepts of OOP, Benefits of OPP, Application of OOP.

UNIT II
Introduction to C++
What is C++, A simple C++ Program, More C++ statements, Structure of C++ Program.

Tokens, Expression and controls Structures, Tokens , Keywords, Identifiers and Constants, C++ data types, Variables: Declaration, Dynamic initialization of variables, Reference variables, Operators in C++ : Scope resolution operator, Member, deferencing Operators, Memory Management Operators, Manipulators, Type cast operators, Expressions and Control Structures.

Functions
The main() function, Function Prototyping, Call by reference, Return by reference, Inline function, Function Overloading.

UNIT III
Classes and Objects
Introduction, Specifying a Class, Defining member Functions, C++ Program with Class, Nesting of Member functions, Private member functions, Memory Allocation for Objects, Static Data members, Static Member Functions, Arrays within a Class, Arrays of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects.

Pointers
Pointers : Declaration and initializing, Manipulation of pointers, pointers Expression and Pointer Arithmetic, Pointer with Arrays, Arrays of Pointers, Pointers to objects, this pointers, Arrays of Pointers to Objects

Constructors and Destructors
Constructors, Parameterized Constructors, Multiple Constructors in a class, Copy constructor, Destructors.

Operator overloading
Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Type Conversions.

UNIT IV
Inheritance and Polymorphisms
Introduction, Defining Derived Classes, Single inheritance, Multiple inheritance, Hierarchical inheritance, Multilevel inheritance, Hybrid inheritance, Virtual Base Classes, Polymorphism, static and dynamic binding, Constructor in Derived Classes, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.

UNIT V
I/O Operations and Files
C++ Stream Classes, Unformatted I/O Operations, Formatted I/O operations, Classes for File Streams, Opening and Closing a File : open() and close() functions, Manipulators of File Pointers : seekg(), seekp(), tellg(), tellp() functions, Sequential Input and output Operations : put (), get(), write(), read() functions, Error handling File Operations : eof(), fail(), bad(), good() .

Reference Books:

1. E. Balagurusamy - Object Oriented Programming with C++ - TMH.
2. Robert Lafore - Object Oriented Programming in Microsoft C++ - Galgotia.

Suggested List of Experiments:

1. Write a C++ Program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of class objects. Read and display the contents of the array.
2. Write a C++ program to declare Struct. Initialize and display contents of member variables.
3. Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.
4. Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members.
5. Write a C++ program to read the data of N employee and compute Net salary of each employee (DA=52% of Basic and Income Tax (IT) =30% of the gross salary).
6. Write a C++ to illustrate the concepts of console I/O operations.
7. Write a C++ program to use scope resolution operator. Display the various values of the same variables declared at different scope levels.
8. Write a C++ program to allocate memory using new operator.
9. Write a C++ program to create multilevel inheritance. (Hint: Classes A1, A2, A3)
10. Write a C++ program to create an array of pointers. Invoke functions using array objects.
11. Write a C++ program to use pointer for both base and derived classes and call the member function. Use Virtual keyword
12. Write a Program to overload operators like *, <<, >> using friend function. The following overloaded operators should work for a class vector.
13. Write a program in C++ to highlight the difference between overloaded assignment operator and copy constructor.
14. Write a program to implement the exception handling with re throwing in exception.